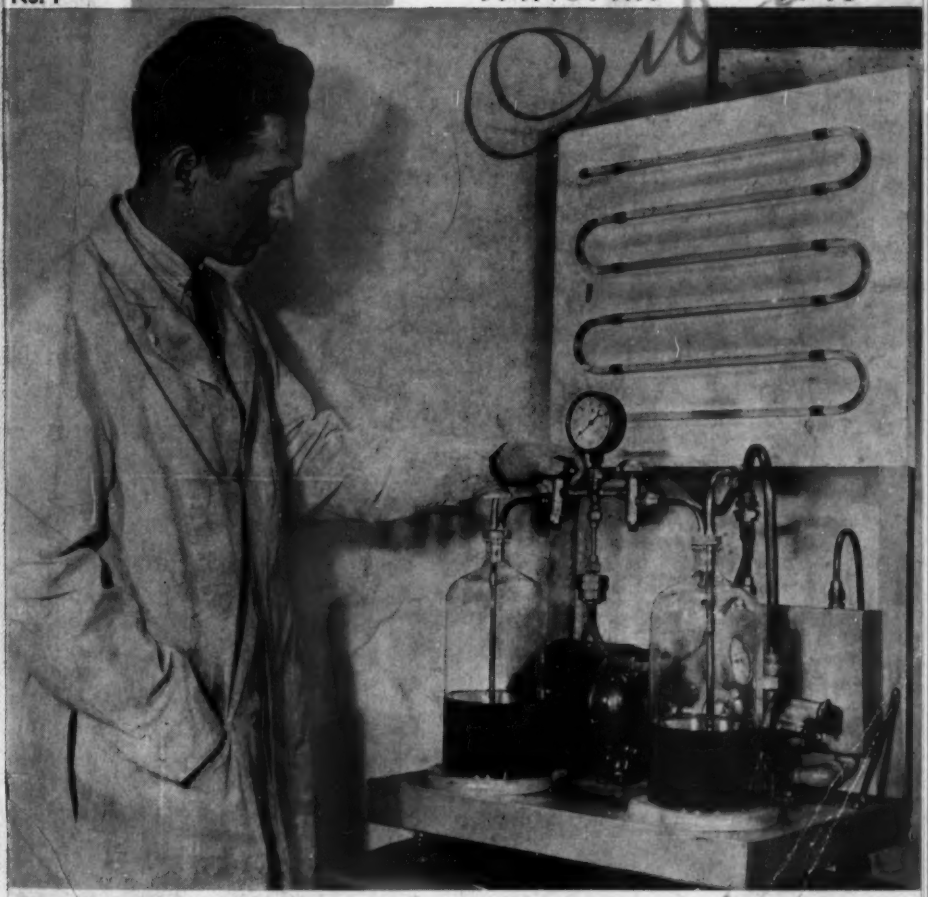
The Refrigeration Service Engineer

Vol. 8
No. 1

JANUARY • 1940



PRESSURE DROP IN METHYL LINES • A LOCKER STORAGE SYSTEM • SERVICE KINKS •

THE REFRIGERATION SERVICE ENGINEER. Nickerson & Collins Co., Publishers. 435 N. Waller Ave., Chicago, Ill. Published monthly. Vol. 8, No. 1, January, 1940. Entered as second class matter March 4, 1938, Chicago, Ill., under the Act of March 3, 1879. Subscription in United States, $2.00 per year; all other countries, $3.00 per year.

The Refrigeration Service Engineer

Vol. 8 No. 1

January 1940

A Monthly Illustrated Journal Devoted to the Interests of the Refrigeration Service Engineer in the Servicing of Domestic and Small Commercial Refrigeration Systems and Oil Burners

Official Organ
REFRIGERATION SERVICE ENGINEERS SOCIETY

Cover

This month's front cover shows a triple purpose pump as it appears on display at the 6th Annual R.S.E.S. Convention. An article on page 44 describes its operation.

Published by
Nickerson & Collins Co.
433-435 North Waller Ave.
Chicago
Telephones Austin 1303-1304-1305

EASTERN OFFICE
420 Lexington, New York City
Telephone Lexington 2-4816

Publishers of Technical Books and Trade Journals Serving the Refrigeration Industries for 48 years.

Subscription Rates United States $2.00 per year. Single copies 25c. All other countries $3.00 per year.

TABLE OF CONTENTS

Tech.


Don't fail to see
DETROIT'S NEW DURA-FRAM
(SINGLE DIAPHRAGM)
GAS CHARGED THERMOSTATIC
EXPANSION VALVES
AND AUTOMATIC
EXPANSION VALVES
AT CHICAGO · BOOTHS 88 and 89
—just what the industry has been waiting for—
Gas Charging plus Single Diaphragm Construction
DETROIT LUBRICATOR COMPANY
Canadian Representatives
RAILWAY & ENGINEERING
SPECIALTIES LIMITED
DETROIT, MICHIGAN

The Refrigeration Service Engineer

Vol. 8, No. 1 CHICAGO, JANUARY, 1940 $2.00 per Annum

Pressure Drop of Methyl Chloride in Pipe Lines

By H. G. TANNER and E. W. McGOVERN*

RECENTLY published data for thermodynamic properties[1] and viscosity[2] of methyl chloride now permit more accurate calculation of frictional pressure drop accompanying flow. Pressure drop values for methyl chloride liquid and vapor in refrigerating machines operating in the most commonly encountered range of evaporator temperatures have, therefore, been calculated and are listed in Table I. As a basis for this table, it is assumed that saturated vapor flows through the suction line without acquiring superheat and that liquid at 86° F. flows to the evaporator. Smooth, round, straight pipe (drawn copper or brass tubing) is likewise assumed. Although it is impossible to construct tables of pressure drops directly applicable to the infinite variety of temperatures, pressures, capacities, sizes, shapes, etc., that may be encountered in actual practice, the data assembled in Table I form a convenient basis for estimation of actual values for a given set of conditions. Supplementary data are also presented to facilitate such estimations.

*R. & H Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Del.

Method of Calculation

The well-known Fanning equation was used for calculating the frictional pressure losses. Many forms of this equation have been published, each being adapted to special conveniences. For use in the present work, the equation was cast into the following form:

$$\Delta p = 0.0432\ fSu^2/D \qquad \text{I}$$

where Δp = pressure drop, lb./(sq. in.) (100 ft.)
f = friction factor
S = density of fluid (liquid or vapor). lb./cu.ft.
u = velocity of fluid (liquid or vapor), ft./sec.
D = inside pipe diameter in feet

The equation is accurate only for small pressure drops, that is, losses of not more than a few per cent, and therefore, some of the large values listed in Table I would not apply accurately to 100-ft. lengths of pipe but are useful if applied proportionately to shorter lengths.

Saturated vapor velocities, u_v, were computed by means of the equation:

TABLE I—Frictional Pressure Drop Lbs./(In²) (100 Ft.) for Methyl Chloride in Vapor Suction and Liquid Lines

Saturated Vapor at Evaporator Temperature; Liquid at 86° F.; Pipe of Smooth Brass or Copper

Pipe Diameter		Evap. Temp. Deg. F.	Tons per Day of Refrigeration																								Evap. Temp. Deg. F.	Pipe Diameter	
			1/20		1/10		1/4		1/2		1		2		3		5		10		15		20		30				
Actual I. D. In.	Approx. O. D. In.		Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor	Liquid	Vapor		Actual I. D. In.	Approx. O. D. In.
¼	⅜	40		10.1		34.0																					40	¼	⅜
		20	0.244	14.9	0.822	50.1	3.02		10.0		33.4																20		
		0		22.7		76.2																					0		
		−20	0.264	36.4	0.544	123.	3.84		10.7		35.6																−20		
⅜	½	40		1.47		4.95																					40	⅜	½
		20	0.047	2.17	0.099	7.30	0.444		1.47		4.88		16.3														20		
		0		3.11		10.4																					0		
		−20	0.049	3.20	0.103	17.4	0.473		1.56		5.19		17.4														−20		
½	⅝	40		0.362		1.25																					40	½	⅝
		20		0.455		1.58																					20		
		0		0.556		2.07																					0		
		−20		1.37	0.088	4.59	0.183		0.406		1.34		4.48		9.13		22.4										−20		
⅝	¾	40		0.132		0.442	0.033	2.20	0.131	7.46	0.438	28.7	1.44		2.92		7.14		24.3								40	⅝	¾
		20		0.165		0.551		3.24		11.0		37.0															20		
		0		0.208		0.694		4.03		10.9		36.1															0		
		−20		0.475		1.59	0.058	7.93	0.142	27.1	0.469	93.5	1.53		5.17		7.76		29.4								−20		
¾	⅞	40				0.090				0.443		1.50															40	¾	⅞
		20				0.122				0.653	0.027	2.22	0.090	5.14													20		
		0				0.162				0.899		3.20		11.0													0		
		−20				0.322				1.60	0.029	5.43	0.096	18.6	0.317		0.640		1.57		5.30		10.8		17.8		37.3	−20		
⅞	1	40						0.134		0.453		1.54				5.37		11.0									40	⅞	1
		20						0.196		0.668	0.027	2.28	0.090	7.85	0.152	16.2	0.442		1.49		5.04		5.06		10.4		20		
		0						0.263		1.03		3.49		12.0		25.0											0		
		−20						0.484		1.64	0.029	5.59	0.097	19.3	0.196	40.0	0.476		1.60		5.27		5.45		11.2		−20		
1	1⅛	40						0.034		0.115		0.391		1.34		2.77		6.95									40	1	1⅛
		20						0.050		0.170		0.577		1.96	0.047	4.09	0.114	10.3	0.382		0.779		1.29		2.65		20		
		0						0.077		0.260		0.885		3.03		6.27		12.7									0		
		−20						0.123		0.416		1.41		4.86	0.080	10.1	0.122	25.2	0.409		0.835		1.88		2.84		−20		
1¼	1⅜	40										0.099		0.339		0.698		1.74		0.10		12.8					40	1¼	1⅜
		20										0.140		0.480		1.01		2.55		2.03		16.5		0.388		0.670	20		
		0										0.194		0.666		1.38		3.65		13.9		29.1					0		
		−20										0.350		1.23		2.53		6.34		22.3		48.7		0.211		0.349	0.716	−20		
1½	1⅝	40												0.049		0.100		0.249		0.588		1.80		3.05		6.40	40	1½	1⅝
		20												0.072		0.148		0.368		1.28	0.029	2.65	0.048	4.61	0.097	9.50	20		
		0												0.111		0.227		0.565		1.71		4.11		6.94		14.0	0		
		−20												0.177		0.364		0.907		3.16	0.031	6.81	0.051	11.2	0.104	23.5	−20		
2	2⅛	40																0.063		0.218		0.454		0.792		1.60	40	2	2⅛
		20																0.083		0.322		0.670		1.13		2.33	20		
		0																0.112		0.432		1.02		1.57		3.24	0		
		−20																0.229		0.792		1.87		2.79		5.84	−20		
2½	2⅝	40																		0.075		0.155		0.269		0.540	40	2½	2⅝
		20																		0.110		0.228		0.393		0.813	20		
		0																		0.149		0.312		0.542		1.24	0		
		−20																		0.272		0.562		0.950		1.98	−20		
3	3⅛	40																				0.085		0.109		0.226	40	3	3⅛
		20																				0.128		0.161		0.334	20		
		0																				0.180		0.226		0.473	0		
		−20																				0.255		0.324		0.825	−20		
4	4⅛	40																						0.027		0.057	40	4	4⅛
		20																						0.040		0.084	20		
		0																						0.062		0.129	0		
		−20																						0.089		0.205	−20		

TABLE II—Velocity, Ft./Sec., of Methyl Chloride Saturated Vapor For One Ton/Day of Refrigeration

Input Liquid at 86° F.

Actual Inside Diameter of Pipe	Evap. Temp.	Velocity	Actual Inside Diameter of Pipe	Evap. Temp.	Velocity	Actual Inside Diameter of Pipe	Evap. Temp.	Velocity
Inches	° F	Ft./Sec.	Inches	° F.	Ft./Sec.	Inches	° F	Ft./Sec.
1/8	40	576	9/16	40	28.6	2	40	2.26
	20	846		20	42.0		20	3.32
	0	1,292		0	64.1		0	5.07
	−20	2,056		−20	102		−20	8.07
3/16	40	255	3/4	40	16.1	2½	40	1.45
	20	375		20	23.6		20	2.13
	0	573		0	36.1		0	3.25
	−20	912		−20	57.4		−20	5.17
1/4	40	145	1	40	9.05	3	40	1.00
	20	213		20	13.3		20	1.48
	0	325		0	20.3		0	2.25
	−20	517		−20	32.3		−20	3.59
5/16	40	92.6	1½	40	4.02	4	40	0.565
	20	136		20	5.91		20	0.831
	0	208		0	9.02		0	1.27
	−20	331		−20	14.4		−20	2.02
7/16	40	47.2						
	20	69.4						
	0	106						
	−20	169						

$$u = \frac{VC}{60A} \qquad \text{II}$$

where

V = piston displacement, cu. ft./min., for one ton per day of refrigeration.
Piston displacement data of Table III, calculated from revised thermodynamic data[1] were used.

C = refrigerating capacity, tons/day.

A = area of pipe, sq. ft.

The values for saturated vapor velocity per ton/day are very convenient to use in the solution of pressure drop problems involving not only saturated vapor but superheated vapor and liquid flow as well. They are presented in Table II.

As a preliminary to calculation of friction factor f of equation I, the type of flow, viscous (straight line) or turbulent, must be determined. This is done by calculating, for the given set of conditions, the Reynolds number, a dimensionless index which, by its magnitude, indicates whether the flow is turbulent or viscous. The Reynolds number is obtained from the equation:

$$Re = \frac{DuS}{Z} \qquad \text{III}$$

Re = Reynolds number

Z = viscosity of the fluid, lb./ft. sec. = centipoises/1488

When Reynolds number is 2000 or less, the flow is viscous in type and the friction factor f, is obtained from the equation:

$$f = 16/Re \qquad \text{IV}$$

On the other hand if the Reynolds number exceeds 4000, turbulent flow exists. Between 2000 and 4000 flow is intermediate but is generally considered turbulent[3,4].

When turbulent flow was indicated, the friction factor was computed from the equation:

$$f = 0.00140 + 0.125\,Re^{-0.32} \qquad \text{V}$$

Table IV lists the viscosity values for methyl chloride liquid and vapor recently determined in the du Pont laboratories.[2] The

TABLE III—Piston Displacement—Methyl Chloride—Between Indicated Evaporator and Condenser Conditions

Cubic feet per minute saturated methyl chloride vapor per ton of refrigeration per day

Evaporator Conditions			Condenser Conditions						
Pressure Lbs. Abs. →			62.00	73.41	94.70	100.6	116.7	134.5	154.2
↓	Pressure Lb. Gauge →		47.30	58.71	80.00	85.95	102.0	119.8	139.5
↓	↓	Temp. → ° F.	60	70	86	90	100	110	120
43.25	28.56	40	2.78	2.85	2.96	2.99	3.07	3.15	3.24
35.68	20.98	30	3.35	3.43	3.57	3.61	3.70	3.80	3.91
29.16	14.46	20	4.09	4.18	4.35	4.40	4.51	4.64	4.77
23.60	8.903	10	5.02	5.14	5.35	5.41	5.55	5.70	5.87
21.15	6.455	5	5.58	5.72	5.95	6.01	6.17	6.34	6.53
18.90	4.201	0	6.23	6.38	6.64	6.71	6.89	7.09	7.29
14.96	0.266	−10	7.81	8.00	8.34	8.44	8.65	8.89	9.15
11.71	6.090*	−20	9.90	10.1	10.6	10.7	11.0	11.3	11.6
9.04	11.52*	−30	12.7	13.0	13.6	13.7	14.1	14.5	14.9
6.88	15.92*	−40	16.5	16.9	17.7	17.9	18.4	18.9	19.5

*Inches of mercury below 1 atmosphere.

viscosity of liquid methyl chloride as a function of temperature at saturation pressure is expressed by the equation:

$$\log_{10} Z(\text{liq.}) = -2.2478 - 0.6399 \log_{10}(184.58 + t) \qquad \text{VI}$$

Similarly, the viscosity for the vapor at one atmosphere may be derived from the equation:

$$Z\ (\text{vap.}) = 0.542 \times 10^{-6} \sqrt{t + 459.6} - 5.309 \times 10^{-6} \qquad \text{VII}$$

In equations VI and VII, t refers to the temperature in degrees Fahrenheit.

No corrections were made for the effect of pressure on the viscosity of methyl chloride, vapor or liquid, because these pressure coefficients are known to be negligible.

Special Conditions

A few calculations have been made to give indications of effects on pressure drop of varying the refrigerant liquid temperature, and of superheating suction gas. Discussions of these conditions, as well as of pressure drop of high pressure suction gas, follow.

Superheated vapor and liquid velocities may be derived from saturated vapor velocities of Table II by applying the rule that in a closed system of uniform pipe diameter, velocity of flow, u, is inversely proportional to fluid density, S.

$$u_2 = u_1 \left(\frac{S_1}{S_2} \right) \qquad \text{VIII}$$

Appropriate factors are, of course, applied for variations in pipe diameter. Velocity for a one-ton machine multiplied by the tonnage of the machine under consideration gives velocity for the latter.

Effect of Liquid Temperature on Suction Line Drop

A change in temperature of input liquid alters the refrigerating capacity of a given machine unless the speed of the machine is changed to offset it. At constant capacity, changes in weight and volume of gas handled would of course affect pressure drop.

Velocity of suction gas for a machine with input liquid differing from 86° F., but of refrigerating capacity equal to that of a machine with 86° F. liquid, is obtained by multiplying the velocity for the 86° condition by the ratio of the piston displacements

TABLE IV—Viscosity of Methyl Chloride[2]

Temperature		Vapor*		Liquid**	
°F.	°C.	Centipoises	Lb./ft. sec. x 10^4	Centipoises	Lb./ft. sec. x 10^4
−40	−40	0.0086	0.0578	0.349	2.34
−20	−28.9	.0090	0.605	.321	2.16
0	−17.8	.0094	.0632	.298	2.00
20	− 6.7	.0098	.0659	.279	1.87
40	+ 4.4	.0101	.0679	.263	1.77
60	15.6	.0105	.0706	.249	1.67
80	26.7	.0108	.0726	.237	1.59
100	37.8	.0111	.0746	.226	1.52
120	48.9	.0115	.0773	.217	1.46
140	60.0	.0118	.0793	.208	1.40
160	71.1	.0122	.0820	.200	1.34
180	82.2	.0125	.0840	.193	1.30
200	93.3	.0128	.0860	.186	1.25
220	104.4	.0131	.0880	.180	1.21
240	115.6	.0134	.0901	.175	1.18

*Based on measurements on vapor at one atmosphere.
**Saturated Liquid.

(Table III) corresponding to the two liquid temperatures concerned.

In other words:

$$u_2 = u_1 C \left(\frac{V_2}{V_1}\right) \qquad \text{IX}$$

where u_2 = saturated vapor velocity for machine of tonnage C employing input liquid at temperature other than 86° F.

u_1 = saturated vapor velocity for one ton machine employing 86° input liquid.

V_1 = piston displacement per ton capacity, based on 86° F. input liquid, cu. ft./min.

V_2 = piston displacement per ton capacity, based on input liquid at the temperature under consideration.

C = refrigerating capacity of machine under consideration, tons/day.

Thus, pressure drop in the suction line for a one commercial ton per day installation, with evaporator at —20° F. and input liquid at 70° F. was found to be 1.31 lb./(sq. in.) (100 ft.) of ¾" tubing. For the same capacity and evaporator temperature, the pressure drop would be 1.41 lb./(sq. in.) (100 ft.) for 86° F. input liquid; 1.58 lbs. for 100° F. liquid. These results indicate that in the range considered, a change of 2° F. in liquid temperature causes a change of about 1 per cent in the same direction in the suction-line pressure drop when capacity is kept constant by changing volume displacement.

If the small changes in friction factor occasioned by moderate changes in velocity are neglected, the suction gas pressure drop data of Table I based on 86° F. liquid, are readily converted to other liquid temperature conditions, capacities unchanged, by the equation:

$$\Delta p_2 = \Delta p_1 \left(\frac{V_2}{V_1}\right)^2 \qquad \text{X}$$

where

Δp_1 = pressure drop in suction line with input liquid at 86° F.

Δp_2 = pressure drop in suction line with input liquid at temperature under consideration.

Superheated Vapor

Determination of pressure drop of superheated vapor is aided by the use of Table II. Suppose, for example, the pressure drop of the superheated compressed gas in the line connecting compressor and condenser is to be calculated. Assume the line to be ¾ in. inside diameter, one ton/day refrigeration, condenser temperature and input liquid at 86° F. and evaporator at —20° F. Reference to thermodynamic data[1] for the condition of the gas after compression shows the pressure in the line to be 94.7 lb./sq. in., temperature 219° F., and density 0.6887 lb./cu. ft. Table II indicates that the saturated suction vapor would have a velocity of 57.4

ft./sec. Applying equation VIII and assuming no cooling before the condenser is reached, the superheated compressed gas velocity would be 10.7 ft./sec. Equation I then indicates that the pressure drop in the compressor-condenser line would be 0.289 lb./(sq. in.) (100 ft.).

For a condenser temperature of 130° F., refrigerating capacity, evaporator temperature, pipe size and input liquid (86° F.) remaining the same, the pressure drop in the compressor-condenser line would be 0.175 lb./sq. in.) (100 ft.). It may thus be seen that, other conditions remaining the same, volume of high pressure gas, and pressure drop in high pressure gas line, both decrease as condensing temperature and pressure increase; also, that tubing of a size suitable for the suction line is more than adequate for the compressed gas line.

Superheated Vapor in Suction Line

When vapor between evaporator and compressor becomes superheated, the weight of gas handled to produce a given refrigerating effect remains the same provided temperature of input liquid is unchanged. However, under these conditions, volume is increased sufficiently to raise the pressure loss. There are many possible conditions in a suction line, even when excluding the question of heat exchangers of varying efficiencies, and the estimation of an average temperature for calculating viscosity or an average density becomes difficult. Furthermore, calculation of pressure drop by methods of calculus for a line in which both temperature and density are changing would be more complicated than necessary when data of design quality are desired. A practical procedure for calculating the pressure drop in a suction-line with evaporator at a given temperature and suction gas entering the compressor at a higher temperature, would be to consider the flow as being isothermal at the lower temperature for a portion of the length, and isothermal at the higher temperature for the remainder of the distance. The position of the dividing line between these two sections, each of assumed constant temperature, must be estimated from local conditions. Suppose, for example, it be assumed that saturated suction gas flows 50 feet at 0° F. and 50 feet superheated at 40° F. with refrigerating capacity the same as when suction vapor is saturated throughout. The pressure drop in the 50 ft., 0° section for ¾ in. I. D. tubing, 86° input liquid, and one ton capacity would be one-half of the 0.885 pound drop for 100 ft. as listed in Table I or 0.442 lb./sq. in. The absolute pressure therefore at the end of the first 50 ft. section would be $18.90 - 0.442 = 18.46$ lb./sq. in.

The density of vapor at 18.46 lb./sq. in., 40° F. is determined from thermodynamic tables to be 0.1793 lb./cu. ft. The velocity for saturated vapor obtained from Table II and the proportionate density values are substituted in equation VIII to obtain velocity in the 40° section which is thus found to be 7.26 ft./sec. These data enable the factors in equation I to be determined, whence it is found that the pressure drop in the 40° section will be 0.505 lb./sq. in. Total pressure loss for the combination will be $0.442 + 0.505 = 0.947$ lb./sq. in. which represents an increase of about 7 per cent over the loss calculated for isothermal flow at 0° F.

Had the distance of flow of 0° saturated vapor been infinitesimal, *i.e.*, the flow for the entire 100 ft. considered isothermal for superheated vapor at 40°, the pressure loss would have amounted to 0.991 lb./sq. in. which is an increase of nearly 11 per cent over the loss for 0° saturated vapor.

These results indicate that the added pressure drop brought about by superheat in the suction line is high enough to warrant its consideration by the design engineer.

The data herein presented have been compared with those of other investigators[5] and in general have been found to be in agreement to the extent that might be expected in view of the new, more accurate thermodynamic and viscosity data that were used.

REFERENCES

[1]Tanner, Benning and Mathewson, Ind. Eng. Chem. 31, 878 (1939).
[2]Benning and Markwood, Refrig. Eng. 37, 243 (1939).
[3]Genereaux, Chem. & Met. 44, 241 (1937).
[4]Drew, Koo, and McAdams, Trans. Am. Inst. Chem. Eng. 28, 56 (1932).
[5]Gygax, Willson and Clark, Refrig. Serv. Eng. 6, 26 (1938).
Stickney, Refrig. Eng. 35, 261 (1938).
Windham, Heat., Piping, and Air Cond. 11, 6 (1939).
Doremus, Heat., Piping, and Air Cond. 9, 603 (1937) Oct., Nov. 669-673 (1937).
Schultz, Ice and Refrig. 84, 211 (1933); 85, 9 (1933).
Chicago Master Steamfitters' Association, Air Cond. Refrig. News, May 19 (1937).

Simplified Method of Heat Transfer Calculation

PROPER insulation is one of the vital essentials of a well constructed refrigerator. As the purpose of a refrigerator is to provide a storage compartment in which the temperature may be maintained below that of room temperature, there is a continual tendency for the heat on the outside of the cabinet to enter the interior of the refrigerator. Any such heat which enters the refrigerator must be removed by the refrigerating equipment in order to maintain the desired temperature. It is, therefore, evident that the refrigerator should be so constructed that this heat leakage from the exterior is held as low as possible. Therefore, in any refrigerator some means must be provided which will minimize this leakage.

The following is a table of relative conductivities of material often-times used in refrigerators:

TABLE 1. RELATIVE CONDUCTIVITY OF VARIOUS INSULATING MATERIALS

MATERIAL	WEIGHT PER CUBIC FOOT	RELATIVE CONDUCTIVITY
Corkboard	11.2	1.
Celotex	18.2	1.06
Dry-Zero	1.0	.77
Balsam Wool	2.2	.87
Insulite	16.2	.94
Balsa Wood	8.8	1.28
Sawdust (Loosely packed)	12.0	1.29
Rock Wool	6.0	.84
Air (Still) 2" or less	0.25	.45
Mineral Wool	12.0	.87
Rock Cork	14.5	1.2

Moisture will increase the conductivity of an insulation. It is, therefore, essential that the insulation in the refrigerator does not absorb moisture. This condition can be guarded against in a number of different ways depending upon the type of insulation used. Some insulations can very satisfactorily be sealed with hydrolene, while others must be enclosed in water-proof paper and this paper sealed to the frame of the refrigerator.

The thickness of the insulation required in a refrigerator wall depends upon the conductivity of the insulation used and also upon the temperature differential between the interior of the refrigerator and the surrounding room temperature. The insulation thicknesses given in the heat leakage tables are based upon the actual thickness of the insulation and must not be confused with the total wall thickness. A refrigerator may have a wall that is 5 inches thick but only three inches of insulation.

Insulation Suggestions

On refrigeration equipment furnished by this company where the refrigerators are furnished as well as the necessary mechanical equipment, the dealer will need have little concern regarding the insulation as samples of all refrigerators furnished by us have been tested in our laboratories and the insulation found to be satisfactory. However, where mechanical refrigerating equipment is installed to refrigerate cabinets or coolers purchased by the user from another source, it is necessary that the dealer be familiar with the various types of insulation, especially their applications and conductivities. The insulation of every refrigerator should be checked before refrigerating equipment is installed. If the insulation is not satisfactory it is much better to refuse to install equipment than to go ahead and install the equipment and have a dissatisfied customer, even though the cause is due to the inferiority of the refrigerator rather than the mechanical equipment.

In many of the earlier refrigerators sold on the market, only an air space was used in the walls as insulation. Still air would be a very good insulator. This condition, however, is impossible. Due to the variation in the temperature of the exterior wall and the interior wall, convection of air current is immediately started within this space. It can

B. T. U. Heat Leakage Table for All Types of Refrigerators and Market Coolers
(Based on External Area)

AVERAGE USAGE

40 DEGREE TEMPERATURE DIFF. TABLE

Sq. Ft. Insulated Outside Surface	Insulation Thickness (Cork or Equal)							Sq. Ft. Glass Outside Surface	Glass		
	1"	1½"	2"	2½"	3"	3½"	4"		Single	Double	Triple
50	10100	8700	7700	7100	6500	6100	5900	1	1100	500	350
60	12100	10400	9200	8500	7800	7300	7100	2	2300	1000	700
70	14100	12200	10800	9900	9100	8500	8300	3	3400	1500	1000
80	16200	13900	12300	11400	10400	9800	9400	4	4600	2000	1350
90	18200	15700	13900	12800	11700	11000	10600	5	5700	2500	1700
100	20200	17400	15400	14200	13000	12200	11800	6	6800	3000	2000
110	22200	19100	16900	15600	14300	13400	13000	7	8000	3500	2400
120	24200	20900	18500	17000	15600	14600	14200	8	9100	4000	2700
130	26300	22600	20000	18500	16900	15900	15300	9	10200	4500	3100
140	28300	24400	21600	19900	18200	17100	16500	10	11400	5000	3400
150	30300	26100	23100	21300	19500	18300	17700	11	12500	5500	3700
160	32300	27800	24600	22700	20800	19500	18900	12	13700	6000	4100
170	34300	29600	26200	24100	22100	20700	20100	13	14800	6500	4400
180	36400	31300	27700	25600	23400	22000	21200	14	15900	7000	4700
190	38400	33100	29300	27700	24700	23200	22400	15	17100	7500	5100
200	40400	34800	30800	28400	26000	24400	23600	16	18200	8000	5400
210	42400	36500	32300	29800	27300	25600	24800	17	19300	8500	5700
220	44400	38300	33900	31200	28600	26800	26000	18	20500	9000	6100
230	46500	40000	35400	32700	29900	28100	27100	19	21600	9500	6400
240	48500	41800	37000	34100	31200	29300	28300	20	22800	10000	6800
250	50500	43500	38500	35500	32500	30500	29500	21	23900	10500	7100
260	52500	45200	40000	36900	33800	31700	30700	22	25000	11000	7400
270	54580	47000	41600	38300	35100	32900	31900	23	26200	11500	7800
280	56600	48700	43100	39800	36400	34200	33000	24	27300	12000	8100
290	58600	50500	44700	41200	37700	35400	34200	25	28500	12500	8500
300	60600	52200	46200	42600	39000	36600	35400	26	29600	12900	8800
310	62600	54000	47700	44000	40300	37800	36600	27	30700	13400	9100
320	64600	55700	49300	45400	41600	39000	37800	28	31900	13900	9500
330	66700	57400	50800	46900	42900	40300	38900	29	33000	14400	9800
340	68700	59200	52400	48300	44200	41500	40100	30	34100	14900	10100
350	70700	60900	53900	49700	45500	42700	41300	31	35300	15400	10500
360	72700	62600	55400	51100	46800	43900	42500	32	36400	15900	10800
370	74700	64400	57000	52500	48100	45100	43700	33	37600	16400	11200
380	76800	66100	58500	54000	49400	46400	44800	34	38700	16900	11500
390	78800	67900	60100	55400	50700	47600	46000	35	39800	17400	11800
400	80800	69600	61600	56800	52000	48800	47200	36	41000	17900	12200
410	82800	71300	63100	58200	53300	50000	48400	37	42100	18400	12500
420	84800	73100	64700	59600	54600	51200	49600	38	43200	18900	12800
430	86900	74800	66200	61100	55900	52500	50700	39	44400	19400	13200
440	88900	76600	67800	62500	57200	53700	51900	40	45500	19900	13500
450	90900	78300	69300	63900	58500	54900	53000	41	46700	20400	13900
460	92900	80000	70800	65300	59800	56100	54300	42	47800	20900	14200
470	94900	81800	72400	66700	61100	57300	55500	43	48900	21400	14500
480	97000	83500	73900	68200	62400	58600	56600	44	50100	21900	14900
490	99000	85300	75500	69600	63700	59800	57800	45	51200	22400	15200
500	101000	87000	77000	71000	65000	61000	59000	46	52300	22900	15500
510	103000	88700	78500	72400	66300	62200	60200	47	53500	23400	15900
520	105000	90500	80100	73800	67600	63400	61400	48	54600	23900	16280
530	107100	92200	81600	75300	68900	64700	62500	49	55800	24400	16600
540	109100	94000	83200	76700	70200	65900	63700	50	56900	24900	16900
550	111100	95700	84700	78100	71500	67100	64900	60	68300	29900	20300
560	113100	97400	86200	79500	72800	68300	66100	70	79700	34900	23700
570	115100	99200	87800	80900	74100	69500	67300	80	91000	39800	27000
580	117200	100900	89300	82400	75400	70800	68400	90	102400	45000	30400
590	119200	102700	90900	83900	76700	72000	69600	100	113800	49800	33800
600	121200	104400	92400	85200	78000	73200	70800	200	227600	99600	67600

For Heavy Usage or Restaurant Short Order Usage, add 20% to these figures

Note: **The above leakage is per 24 hrs.**

Courtesy of Ice-O-Matic Corp.

TABLE 4

B. T. U. Heat Leakage Table for All Types of Refrigerators and Market Coolers

(Based on External Area)

AVERAGE USAGE

50 DEGREE TEMPERATURE DIFF. TABLE

Sq. Ft. Insulated Outside Surface	Insulation Thickness (Cork or Equal)							Sq. Ft. Glass Outside Surface	Glass		
	1"	1½"	2"	2½"	3"	3½"	4"		Single	Double	Triple
50	12600	10900	9600	8800	8100	7600	7400	1	1400	600	400
60	15200	13000	11500	10500	9700	9100	8800	2	2800	1200	800
70	17700	15200	13400	12300	11300	10600	10300	3	4300	1900	1300
80	20200	17400	15400	14000	13000	12200	11800	4	5700	2500	1700
90	22700	19500	17300	15800	14600	13700	13200	5	7100	3100	2100
100	25300	21700	19200	17500	16200	15200	14700	6	8500	3700	2500
110	27800	23900	21100	19300	17800	16700	16200	7	10000	4400	3000
120	30300	26000	23000	21000	19400	18200	17600	8	11400	5000	3400
130	32800	28200	25000	22800	21100	19800	19100	9	12800	5600	3800
140	35400	30400	26900	24500	22700	21300	20600	10	14200	6200	4200
150	37900	32600	28800	26300	24300	22800	22100	11	15600	6800	4600
160	40400	34700	30700	28000	25900	24300	23500	12	17100	7500	5100
170	42900	36900	32600	29800	27500	25800	25000	13	18500	8100	5500
180	45500	39100	34600	31500	29200	27400	26500	14	19900	8700	5900
190	48000	41200	36500	33300	30800	28900	27900	15	21300	9300	6300
200	50500	43400	38400	35000	32400	30400	29400	16	22800	10000	6800
210	53000	45600	40300	36800	34000	31900	30900	17	24200	10600	7200
220	55600	47700	42200	38500	35600	33400	32300	18	25600	11200	7600
230	58100	49900	44200	40300	37300	35000	33800	19	27000	11800	8000
240	60600	52100	46000	42000	38900	36500	35300	20	28400	12400	8400
250	63100	54300	48000	43800	40500	38000	36800	21	29900	13100	8900
260	65700	56400	49900	45500	42100	39500	38200	22	31300	13700	9300
270	68200	58600	51800	47300	43700	41000	39700	23	32700	14300	9700
280	70700	60800	53800	49000	45400	42600	41200	24	34100	14900	10100
290	73200	62900	55700	50800	47000	44100	42600	25	35600	15600	10600
300	75800	65100	57600	52500	48600	45600	44100	26	37000	16200	11000
310	78300	67300	59500	54300	50200	47100	45600	27	38400	16800	11400
320	80800	69400	61400	56000	51800	48600	47000	28	39800	17400	11800
330	83300	71600	63400	57800	53500	50200	48500	29	41200	18000	12200
340	85900	73800	65300	59500	55100	51700	50000	30	42700	18700	12700
350	88400	76000	67200	61300	56700	53200	51500	31	44100	19300	13100
360	90900	78100	69100	63000	58300	54700	52900	32	45500	19900	13500
370	93400	80300	71000	64800	59900	56200	54400	33	46900	20500	13900
380	96000	82500	73000	66500	61600	57800	55900	34	48300	21100	14300
390	99000	84600	74900	68300	63200	59300	57300	35	50000	21800	14800
400	101000	86800	76800	70000	64800	60800	58800	36	51200	22400	15200
410	103500	89000	78700	71800	66400	62300	60300	37	52600	23000	15600
420	106100	91100	80600	73500	68000	63800	61700	38	54000	23600	16000
430	108800	93300	82600	75300	69700	65400	63200	39	55500	24300	16500
440	111100	99500	84500	77000	71300	66900	64700	40	56900	24900	16900
450	113600	97700	86400	78800	72900	68400	66200	41	58300	25500	17300
460	116200	99800	88300	80500	74500	69900	67600	42	59700	26100	17700
470	118700	102000	90200	82300	76100	71400	69100	43	61100	26700	18100
480	121200	104200	92200	84000	77800	73000	70800	44	62600	27400	18600
490	123700	106300	94100	85800	79400	74500	72000	45	64000	28000	19000
500	126300	108500	96000	87500	81000	76000	73500	46	65400	28600	19400
510	128800	110700	97900	89300	82600	77500	75000	47	66800	29200	19800
520	131300	112800	99800	91000	84200	79000	76400	48	68300	29900	20300
530	133800	115000	101800	92800	85900	80600	77900	49	69700	30500	20700
540	136400	117200	103700	94500	87500	82100	79400	50	71100	31100	21100
550	138900	119400	105600	96300	89100	83600	80900	60	85300	37300	25300
560	141400	121500	107500	98000	90700	85100	82300	70	99500	43500	29500
570	144000	123700	109400	99800	92300	86600	83800	80	113700	49700	33800
580	146500	125900	111400	101500	94000	88200	85300	90	127900	55900	38000
590	149000	128000	113300	103300	95600	89700	86700	100	142000	62000	42200
600	151500	130200	115200	105000	97200	91200	88200	200	284000	124000	84400

For Heavy Usage or Restaurant Short Order Usage, add 20% to these figures

Note: The above leakage is per 24 hrs.

Courtesy of Ice-O-Matic Corp.

TABLE 5

B. T. U. Heat Leakage Table for All Types of Refrigerators and Market Coolers

(Based on External Area)

AVERAGE USAGE

60 DEGREE TEMPERATURE DIFF. TABLE

Sq. Ft. Insulated Outside Surface	Insulation Thickness (Cork or Equal)							Sq. Ft. Glass Outside Surface	Glass		
	1"	1½"	2"	2½"	3"	3½"	4"		Single	Double	Triple
50	15100	13000	11500	10600	9700	9100	8800	1	1700	700	500
60	18100	15600	13800	12700	11700	10900	10600	2	3400	1500	1000
70	21100	18200	16100	14900	13600	12800	12300	3	5100	2200	1500
80	24200	20800	18400	17000	15600	14600	14100	4	6800	3000	2000
90	27200	23400	20700	19000	17500	16400	15900	5	8500	3700	2500
100	30200	26000	23000	21200	19400	18200	17600	6	10200	4500	3000
110	33200	28600	25300	23400	21400	20100	19400	7	11900	5200	3500
120	36200	31200	27600	25500	23300	21900	21200	8	13600	6000	4000
130	39300	33900	30000	27600	25300	23700	22900	9	15400	6700	4600
140	42300	36500	32300	29700	27200	25500	24700	10	17100	7500	5100
150	45300	39100	34600	31900	29200	27400	26500	11	18800	8200	5600
160	48300	41700	36900	34000	31100	29200	28200	12	20500	8900	6100
170	51300	44300	39200	36100	33000	31000	30000	13	22200	9700	6600
180	54400	46900	41500	38200	35000	32800	31800	14	23900	10400	7100
190	57400	49500	43800	40400	36900	34700	33500	15	25600	11200	7600
200	60400	52100	46100	42500	38900	36500	35300	16	27300	11900	8100
210	63400	54700	48400	44600	40800	38300	37000	17	29000	12700	8600
220	66400	57300	50700	46700	42800	40100	38800	18	30700	13400	9100
230	69500	59900	53000	48900	44700	42000	40600	19	32400	14200	9600
240	72500	62500	55300	51000	46700	43800	42300	20	34100	15000	10100
250	75500	65100	57600	53100	48600	45600	44100	21	35800	15700	10600
260	78500	67700	59900	55200	50500	47400	45900	22	37500	16400	11100
270	81500	70300	62200	57300	52500	49200	47600	23	39200	17200	11600
280	84600	72900	64500	59500	54400	51100	49400	24	40900	17900	12100
290	87600	75500	66800	61600	56400	52900	51200	25	42700	18700	12700
300	90600	78100	69100	63700	58300	54700	52900	26	44400	19400	13200
310	93600	80700	71400	65800	60300	56500	54700	27	46100	20100	13700
320	96800	83300	73700	68000	62200	58400	56400	28	47800	20900	14200
330	99700	85900	76000	70100	64200	60200	58200	29	49500	21600	14700
340	102700	88500	78300	72200	66100	62000	60000	30	51200	22400	15200
350	105700	91100	80600	74300	68000	63900	61700	31	52900	23100	15700
360	108700	93700	82900	76500	70000	65700	63500	32	54600	23900	16200
370	111700	96300	85200	78600	71900	67500	65300	33	56300	24600	16700
380	114800	99000	87600	80700	73900	69300	67000	34	58000	25400	17200
390	117800	101600	89900	82900	75800	71100	68900	35	59700	26100	17700
400	120800	104200	92200	85000	77800	73000	70600	36	61400	26900	18200
410	123800	106800	94500	87100	79700	74800	72300	37	63100	27600	18700
420	126800	109400	96800	89200	81700	76600	74100	38	64800	28300	19200
430	129900	112000	99100	91300	83600	78400	75900	39	66500	29100	19700
440	132900	114600	101400	93500	85500	80300	77600	40	68200	29800	20200
450	135900	117200	103700	95600	87500	82100	79400	41	69900	30600	20700
460	138900	119800	106000	97700	89400	83900	81100	42	71700	31300	21300
470	141900	122400	108300	99800	91400	85700	82900	43	73400	32100	21800
480	145000	125000	110600	102000	93300	87600	84700	44	75100	32800	22300
490	148000	127600	112900	104100	95300	89400	86400	45	76800	33600	22800
500	151000	130200	115200	106200	97200	91200	88200	46	78500	34300	23300
510	154000	132800	117500	108300	99100	93000	90000	47	80200	35100	23800
520	157000	135400	119800	110400	101100	94800	91700	48	81900	35800	24300
530	160100	138000	122100	112600	103000	96700	93500	49	83600	36600	24800
540	163100	140600	124400	114700	105000	98500	95300	50	85300	37300	25300
550	166100	143200	126700	116800	106900	100300	97000	60	102400	44800	30400
560	169100	145800	129000	118900	108900	102100	98800	70	119400	52200	35400
570	172100	148400	131300	121100	110800	104000	100500	80	136500	59700	40500
580	175200	151000	133600	123200	112800	105800	102300	90	153500	69100	45500
590	178200	153600	135900	125300	114700	107600	104100	100	170600	74600	50600
600	181200	156200	138200	127400	116600	109400	105800	200	341200	149200	101200

For Heavy Usage or Restaurant Short Order Usage, add 20% to these figures

Note: The above leakage is per 24 hrs.

Courtesy of Ice-O-Matic Corp.

TABLE 6

B. T. U. HEAT LEAKAGE TABLES*

(Based on External Area)

30 DEGREE TEMPERATURE DIFFERENTIAL

Square Feet of External Surface	Insulation Thickness (Corkboard or Equal)					
	1"	1½"	2"	2½"	3"	4"
1	108 B.T.U.	90 B.T.U.	72 B.T.U.	63 B.T.U.	54 B.T.U.	45 B.T.U.
10	1,080 B.T.U	900 B.T.U.	720 B.T.U.	630 B.T.U.	540 B.T.U.	450 B.T.U.
20	2,160 B.T.U.	1,800 B.T.U.	1,440 B.T.U.	1,260 B.T.U.	1,080 B.T.U.	900 B.T.U
30	3,240 B.T.U.	2,700 B.T.U.	2,160 B.T.U.	1,890 B.T.U.	1,620 B.T.U.	1,350 B.T.U.
50	5,400 B.T.U.	4,500 B.T.U.	3,600 B.T.U.	3,150 B.T.U.	2,700 B.T.U.	2,250 B.T.U.
100	10,800 B.T.U.	9,000 B.T.U.	7,200 B.T.U.	6,300 B.T.U.	5,400 B.T.U.	4,500 B.T.U.

40 DEGREE TEMPERATURE DIFFERENTIAL

Square Feet of External Surface	Insulation Thickness (Corkboard or Equal)					
	1"	1½"	2"	2½"	3"	4"
1	145 B.T.U.	121 B.T.U.	96 B.T.U.	84 B.T.U.	72 B.T.U.	60 B.T U.
10	1,450 B.T.U.	1,210 B.T.U.	960 B.T.U.	840 B T.U.	720 B.T.U.	600 B.T.U.
20	2,900 B.T.U.	2,420 B.T.U	1,920 B.T.U.	1,680 B.T.U.	1,440 B.T.U.	1,200 B.T.U.
30	4,350 B.T U.	3,630 B.T.U.	2,880 B.T.U.	2,520 B.T.U.	2,160 B.T.U.	1,800 B.T.U.
50	7,250 B.T.U	6,050 B.T.U.	4,800 B.T.U.	4,200 B.T.U.	3,600 B.T.U.	3,000 B.T.U.
100	14,500 B.T.U.	12,100 B.T.U	9,600 B.T.U	8,400 B.T.U.	7,200 B.T.U.	6,000 B.T.U.

50 DEGREE TEMPERATURE DIFFERENTIAL

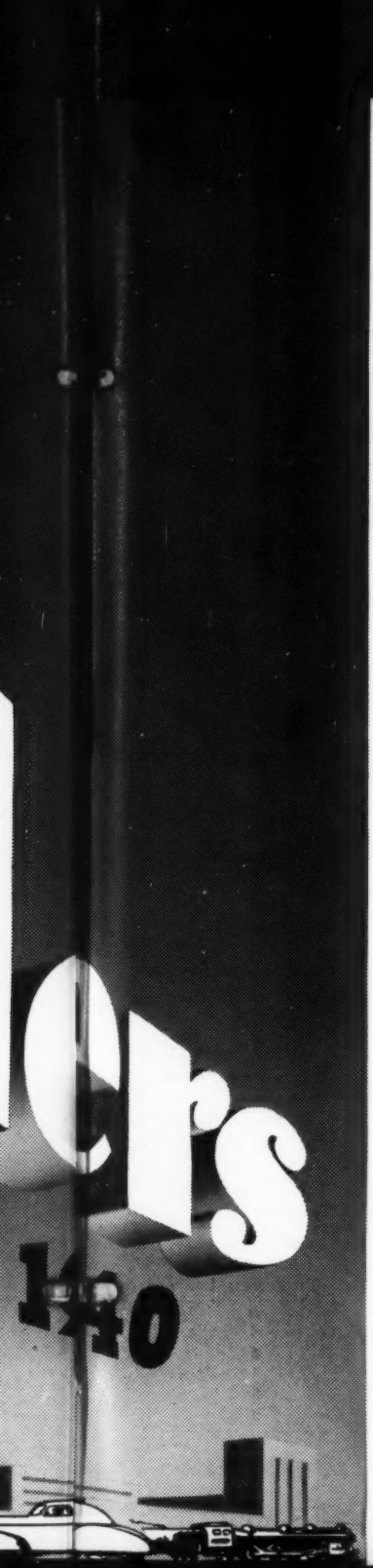
Square Feet of External Surface	Insulation Thickness (Corkboard or Equal)					
	1"	1½"	2"	2½"	3"	4"
1	180 B.T.U	150 B.T.U	120 B.T.U.	105 B.T.U.	90 B.T.U.	75 B.T.U.
10	1,800 B.T U	1,500 B.T.U	1,200 B.T.U.	1,050 B.T.U.	900 B.T.U	750 B.T.U
20	3,600 B.T U	3,000 B.T.U	2,400 B.T.U.	2,100 B.T.U.	1,800 B.T.U.	1,500 B.T.U.
30	5,400 B.T.U.	4,500 B T.U.	3,600 B T.U.	3,150 B.T.U	2,700 B.T.U.	2,250 B.T.U
50	9,000 B.T.U	7,500 B T.U	6,000 B.T.U.	5,250 B.T.U.	4,500 B.T.U.	3,750 B.T.U.
100	18,000 B T U	15,000 B T.U	12,000 B.T.U	10,500 B.T.U.	9,000 B.T.U.	7,500 B.T.U.

*Note: The Heat Leakage figures given above are in terms of B.T.U. per 24 hours and are based upon the specified thicknesses of corkboard properly sealed. NO SERVICE or USAGE is included in the above tables.

Courtesy of Ice-O-Matic Corp.

TABLE 7


fedd
...all set for



New 1940 Refrigeration Products

New Complete Line of Valves

New Smart Packaging

New Styled Wall-Type Unit Coolers

New Series 73 Unit Coolers for Commercial Refrigeration

New Comfort Coolers

New Low Temperature Coolers

New Staggered Tube Coils for Air Conditioning

New Clip-On Superheat Thermometer

See the FEDDERS DISPLAY introducing the new 1940 refrigeration products at the ALL INDUSTRY EXHIBITION, Hotel Stevens, Chicago, Booths 15-16, January 15 to 18.

FEDDERS MANUFACTURING CO.

BUFFALO, N. Y.

readily be seen that this convection would cause the air to be a conductor rather than an insulator. This type of refrigerators should be avoided.

Other refrigerators are constructed with shavings and sawdust in the walls for insulation. These materials are poor insulators and at the very best would only be satisfactory for mechanical refrigeration when an unusual thickness of this material is used and properly wrapped in water-proof paper.

Value of Proper Installation

It must be clearly understood that the heat leakage cannot be based entirely upon the thermal conductivity of an insulation. The manner in which it is installed is an important factor. Corkboard, for instance, should be properly sealed with hydrolene. Most other insulating materials should be enclosed in water-proof paper and this paper sealed to the frame.

The majority of refrigerators now being constructed by the manufacturers of commercial refrigerators are well insulated but the greatest care must be used in regard to refrigerators which have been sold on the market in the past.

Care with Ice Boxes

Special care must be used when installing equipment in a refrigerator which has previously been refrigerated with ice. Ice furnishes moist refrigeration. This condition causes the wood used in the refrigerator to swell and warp. If mechanical refrigerating equipment is installed in such a refrigerator, serious complications may result due to the fact, that the moisture content of the air with mechanical refrigeration is normal. This will cause the refrigerator to dry out and become loose in the seams and joints. This condition and also the consideration that in the majority of cases the user desires a lower temperature after the mechanical refrigerating equipment is installed, will cause excessive heat leakage, thereby increasing the running time of the compressor and in the end making a dissatisfied customer.

A refrigerator which is well constructed and has only been used for possibly two or three years with ice is very often in a good condition and satisfactory for mechanical refrigeration. However, each such case must be treated individually by the local dealer and he must use his best judgment in deciding whether or not equipment should be installed.

Heat Leakage

The heat leakage into a refrigerator is through the walls which, of course, include the doors or other openings. One method of calculating the total amount of heat leakage into refrigerators with the exception of those used for household purposes, may therefore be based upon the total area of external surface. Two refrigerators may have the same number of cubic feet of volume. The shapes of the two refrigerators, however, may be different so that the external area on one may be greater than on the other. Other conditions being equal it can, therefore, readily be seen that the heat leakage into the one will be greater than into the other although their volumes are the same.

In figuring the total external area of a refrigerator, always figure the total number of square feet on both sides, both ends, the top and the bottom. After these figures have been obtained their sum will be the total number of square feet of external surface on the refrigerator.

As an example of the foregoing let us assume that we have a market cooler 8 ft. wide, 9 ft. deep and 10 ft. high. The total external area will be found in the following manner:

8′ × 10′ = 80 sq. ft. × 2 = 160 sq. ft.
9′ × 10′ = 90 sq. ft. × 2 = 180 sq. ft.
9′ × 8′ = 72 sq. ft. × 2 = 144 sq. ft.

Total ..... 484 sq. ft.

The heat leakage tables 4, 5 and 6 are based on the external area of the refrigerator. Table 7 is also based on external area but differs from the others in that it covers leakage only and does not include any service load.

In the tables referred to, corkboard insulation is referred to as standard. When figuring other insulation, use the corkboard Table and then multiply by the factor in Table 1 which corresponds to the insulation used.

TABLE 2. RECOMMENDED INSULATION THICKNESS FOR VARIOUS TEMPERATURES

STORAGE TEMPERATURE °F.	CORKBOARD OR EQIVALENT THICKNESS IN.
-20 to -5	8
- 5 to 5	6
5 to 20	5
20 to 35	4
35 to 45	3
45 and up	2

Specific Heat

In addition to calculating the heat leakages through the walls of a refrigerator and the service on the refrigerator, there is the consideration of heat in products cooled over and above that allowed in the service factor. If the specific heat of such products were the same as water, the B.t.u. load of this part of the refrigeration requirement would be ascertained the same as for water; that is, by simply multiplying the number of pounds by the number of degrees cooled. However, for products other than water the same procedure is followed except that the result is multiplied by the specific heat factor as given in Table 8.

TABLE 8. SPECIFIC HEAT OF VARIOUS FOOD PRODUCTS AND MATERIALS

PRODUCT	SPECIFIC HEAT	
	ABOVE FREEZING	BELOW FREEZING
Water	1.00	.504
Beef	.77	.38
Butter	.60	.34
Buttermilk	.92	
Berries	.90	
Cabbage	.92	
Cheese	.64	
Cream	.65	
Eggs	.76	
Fish (fresh)	.82	.43
Fruits	.92	
Game	.79	
Ice		.504
Ice Cream	.80	.45
Lard	.55	
Melons	.90	
Milk	.90	.47
Mutton	.67	
Oysters (In shell)	.84	.44
Pork	.55	.30
Potatoes (White)	.85	
Poultry	.79	.42
Skim Milk	.95	
Veal	.70	.39
MATERIAL		
Aluminum	.218	
Iron	.11	
Copper	.093	
Wood	.60-67	

As an example of how the foregoing data may be used we will go on with the calculations of the load to be expected on the 8x9x10 foot market cooler which we found had a total outside area of 484 sq. ft.

We will assume this cooler is equipped with two double glass doors 24 inches by 24 inches each which are used for display purposes. Insulation is three inches of Dry-Zero. Maximum outside temperature is 95 degrees and the design temperature of the cooler is 35 degrees. We will further assume that the product load amounts to 400 lbs. of beef per day which enters the refrigerator at a temperature of 60 degrees.

The Total Area = 484 sq. ft.
Glass Area = 8 " "
Net Wall Area = 476 " " .

Referring to Table 6, which is the 60 degree temperature differential table, we will run down the first column under the head (sq. ft. insulated outside surface) until we locate the nearest figure to our net outside surface. This will be 480 sq. ft. Opposite this number in the three-inch column we locate 93,300 B.t.u. per 24 hrs.

Since the heat transfer figures shown in these tables are based on cork and the insulation in our cooler is Dry-Zero it is necessary to make corrections for the difference in conductivity between the two insulations. Referring to Table 1 we find Dry-Zero has a relative conductivity of .77. Using this factor to make corrections we will have 93,300 $\times$ .77 = 71,841 B.t.u. per 24 hrs. Adding our two sources of leakage together we have 71,841 + 4,000 = 75,841 B.t.u. per 24 hrs. total heat leakage through the refrigerator walls.

Product Load

Referring to Table 8 we find that beef has a specific heat of .77 when held at temperatures above freezing. The 400 lbs. per day of beef entering the refrigerator must be cooled from 60 degrees to 35 degrees. The heat load due to the product therefore is:

$400 \times (60 - 35) \times .77 = 7700$ B.t.u. per 24 hrs.

Adding our product load to the total heat leakage we obtain:

75,841 + 7,700 = 83,541 B.t.u. total load.

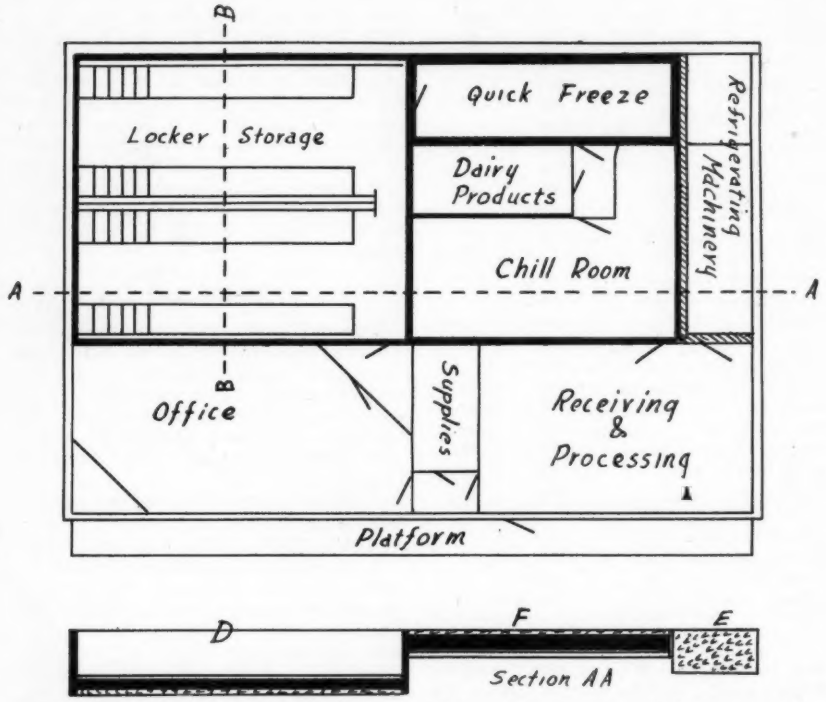
In choosing the size condensing unit required it is probable that we will not want the unit to run more than 16 hours per day. Therefore, the unit will have to have a capacity not less than:

$$\frac{83{,}541}{16} = 5{,}220 \text{ B.t.u. per hr.}$$

A Locker Storage System

By MARTIN G. LANE

WHEN locker storage systems were first started, they were generally an added feature to an already existing cold storage plant, an ice plant or an egg and cream buying station, and were patronized to greater extent by a rural population, who generally came into town two times a week to do their selling and buying. Most of these stations were more or less isolated from the town in general and in most cases were served by an ammonia condensing plant and the purchasing and erection were as a rule let on competitive bids, the lower bid constructing the plant and placing it into operation. If a competitive bid in the lower brackets is analyzed closely by a neutral engineer, he can usually find what has been chopped off here and there in order to make the bid low and attractive. This letting of contracts, especially in this type of equipment has led to some serious troubles and high service costs during the life of the plant, and in some cases personal injuries have been suffered and an ammonia charged



Figs. 1 and 2 — Floor plan and cross section through floor. No excavation under building except for heating equipment. Section AA shows locker storage room floor dropped. Lockers set at level "D." "E" shows machinery foundation level.

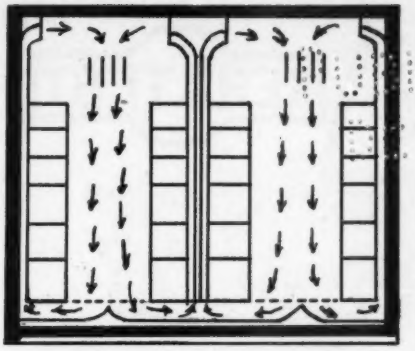


Fig. 3—Section BB showing cork envelope floor and path of circulation. Six inches of Palco wool used in walls. Air channels in floor and walls are ribbed with 16 inch spacing. Exit air passes through controlled grills. Lockers are set on metal grills.

air has created considerable discomfort to the public.

There are a good many well-thinking people today, who think that this same plant without any radical changes can be converted by merely changing refrigerants. Since every refrigerant has its own characteristics such changes complicate matters in several ways. Had the plant in the first instance been properly engineered and erected and placed into operation, there is the likelihood that little or no trouble would have ever been experienced. The same thing applies in a change of refrigerant. Although the same effect in its final analysis is to be produced, the plant must be of such a nature that it can be adjusted to the characteristics of the refrigerant.

Changes Without Proper Engineering Causes Trouble

With the growth of this particular application of refrigeration, well intentioned salesmen have gone into existing plants and sold a new cooling surface and changed the plant over to Freon-12 under the supposition that the particular complaint would be

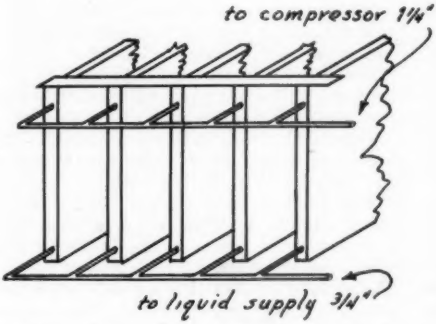


Fig. 4—Plate arrangement in locker storage chill room and in dairy products room.

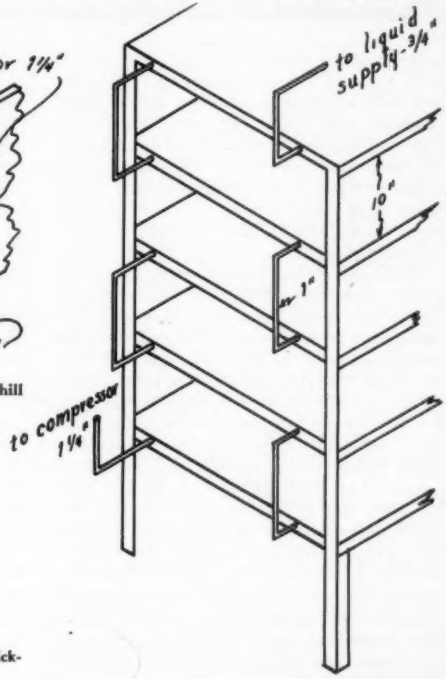


Fig. 5 (right) — Plate arrangement in quick-freeze room.

solved and no more trouble experienced. In most cases it did not correct the complaint and left a lot more troubles in its wake. However one effect was produced. A refrigerant was in the system that did not have all the irritant effects of ammonia and the owner was left with the impression of something safe and if it could be made to work properly it would be fine. The man was sold on safety.

People are being sold more and more on safety these days and that is the way it should be. Once the general idea of a safe refrigerant is sold it is not long before the promoter enters the field and sooner or later we get a refrigerating plant of this nature in the uptown district or residence section. I was called in on such a deal three years ago. The man was sold on the idea and was ready to spend the money, but he wanted a neutral engineer called in before he went too far. I was recommended to the promoter and we got along fine after a fashion. He learned a lot of things about refrigeration and I learned a lot of things about promotion, but his estimates were not in accordance with good practice and it took a little persuasion and sound talk to convince the owner that changes should be made in the plans. This same sales promoter has sold a plant for erection next spring and he will make some money on it. That is one reason why I shall always feel that any salesman needs a thorough grounding in the practical application of the product he is selling.

This plant was sold to use Freon-12. It was to be located on an uptown lot 40 x 125 feet, with a side loading platform, a 350 locker plant, a quick freeze room, a chill room, a dairy products room, a receiving and processing room, a supply room, an office and a refrigerating machinery room. The prospective buyer had a small 4 x 4 multiple effect compressor he had bought at a receivers sale at a small ice plant, which I agreed to rebuild for the job in hand.

The floor plan as indicated in Fig. 1, was decided on. Pocket excavation was made at the locker section and the machinery section, the office section was excavated for a basement and a tunnel was cut through to communicate with the machinery room and to accommodate various piping and electrical conduits. The main floor is reinforced concrete supported between concrete foundation pylons. The completed floor is at the level (F) Fig. 2, and the section (D) for the locker storage was dropped, to pro-

vide an air flue below grill (D). On top of the concrete base, 4, 6 and 8 inches of cork are used, each layer laid in asphalt in the conventional manner, the top is finished with one inch of 1:2 cement flowed and trowled to a smooth finish. All the vertical wall surfaces are insulated with 4, 6 and 8 inch thickness of Palco Wool. The roof is almost flat covered with sheet iron and treated with asphalt and crushed rock. The ceilings proper are trussed type sealed above and below and filled with Palco Wool to a depth of 8 inches. The machinery room roof section is raised to provide room for a liquid cooler, a water tower and other equipment. The main shell of the building is six-inch hollow tile with a four-inch brick veneer.

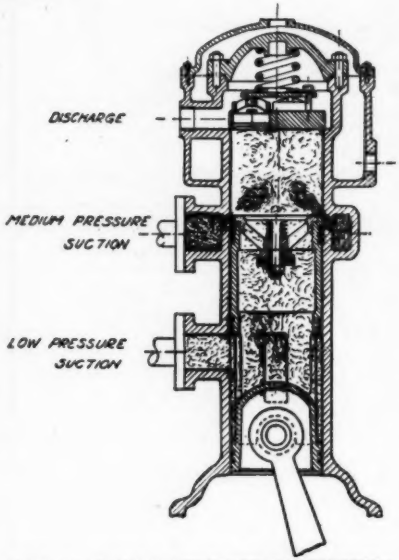


FIG. 6—CROSS SECTION OF COMPRESSOR

This plant was one of the first attempts at controlled humidity in the locker storage systems and the construction is as indicated in Fig. 3. Here can be seen the purpose of dropping the locker room floor. This communicates with a series of flues which are part of the wall at the rear of all the lockers. The exits are through grills which are controlled as to opening. The cooling surface is of the plate type and is arranged for center spill. Each plate in the locker room and the chill room is provided with a V trough section manifolded at one end and drained to a trapped connection to the sewer. Each section is provided with a multiport line to the side and directed at an angle to the face of the plates and connected to air supply lines capable of delivering air at 125 pounds pressure for purpose of defrosting when necessary. Defrosting can be accomplished very rapidly in this manner. The dairy products room, the receiving room and processing room has no cooling surface. All process water comes from a deep well and a vertical boiler in the office basement. A comfort conditioner of the induction type provides comfort conditions in the process room and office in the summer and winter seasons.

The piping throughout the system is hard-drawn copper and varies in size from ¾ inches to 1½ inches and is completely insulated where necessary. The cooling surface in the locker storage section and the chill room is mounted and piped as shown in Fig. 4. The surface in the quick freezer is mounted as shown in Fig. 5. Two expansion valves of the automatic type are used to control the liquid to a combination hook-up of the quick freezer and locker storage and chill room, one of these feeding the combination and the other the chill room. The refrigerant is metered through a bucket type meter at each valve and recorded in pounds at the control panel located in the office. Thermometer wells, thermometers and pressure connections are inserted at the outlet of each combination section; at the condenser unit suction, discharge and water supply; at the liquid manifolds and just beyond each expansion valve. All pressure and temperature recording instruments are mounted on the main control panel. The use of stop valves and recording devices cannot be urged too strongly, for it is by this means that troubles in their infancy are isolated and corrected before something more serious takes place.

The freezer-locker storage combination is provided with an automatic temperature piloted booster which is magnetically operated. This feature is unique in that when a demand is made for more refrigeration in the locker storage room, the booster connection is automatically opened and liquid refrigerant admitted between the two sections.

When the freezer section is down to temperature this section is isolated at both liquid and suction ends by a dual control

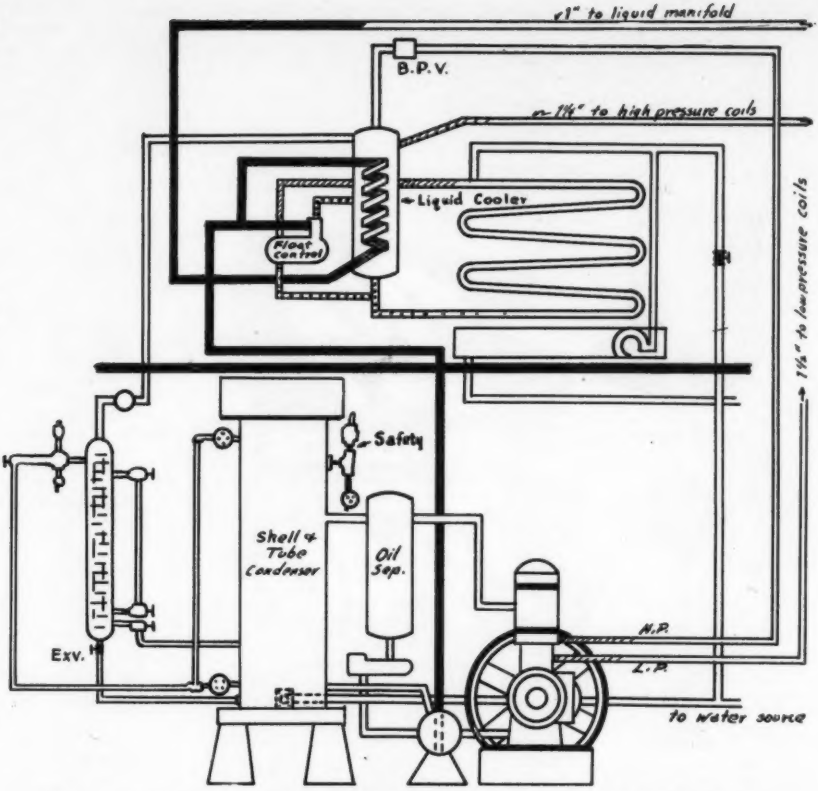


FIG. 7—CONDENSER UNIT HOOK-UP SHOWING LIQUID COOLER AND PURGER

solenoid arrangement and the liquid bypassed through the booster to the locker storage, when this section is down to temperature a solenoid operated stop valve blanks the suction line. This solenoid is electrically interlocked with a similar stop in the suction line from the chill room and may or may not shut the machine down depending on the relative position of the interlocking device. The compressor is a multiple effect, single action, two-cylinder vertical job. The low pressure vapor from the freezer-locker combination enter the cylinder near its lower part and strikes the piston between the center rings and the rings at the skirt proper and enters through the truncated section and up through the piston valve into the cylinder space on the downward stroke. The high pressure vapor from the chill room return to the liquid cooler in this case and from the liquid cooler to the compressor where they enter a special section of the cylinder casting with ports into the cylinder and which are opened as the piston reaches lower dead center. This high pressure vapor on entering the cylinder compresses the low pressure vapor without mechanical effort and on the up-stroke all is swept out through the discharge valve openings. The cylinder and piston arrangement are shown in Fig. 6. The condensing unit also includes a manually operated purger and a liquid cooler. The liquid cooler is quite an advantage in any Freon-12 system. The latent heat is low and any loss of latent heat is a loss in the system. The machinery room is fully protected against excess pressures. A special

type of oil separator was installed for this equipment which effectively separates the oil and returns it to the crankcase.

As stated before, the plant is so arranged that trouble can be located before it increases in intensity. No indication of trouble will be older than 24 hours before being noted and isolated and corrected and in any plant the main thing is to be able to recognize trouble and prevent it from producing some undesirable effect. Figure 7 gives a general idea of the condensing unit piping.

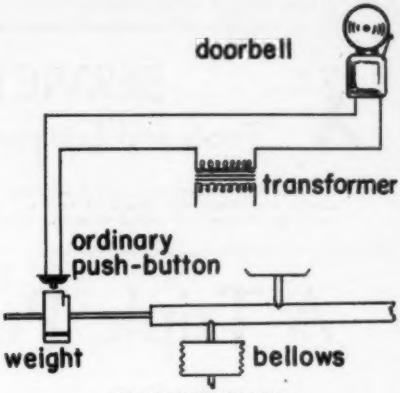
This plant completed, including the site cost $10,750, or a little over $80 per installed locker, which when compared with the method of control compares favorably with the average plant. The plant started out with a 75 percent load factor. It is now 95 percent. Last year the plant yielded a net profit of $4,000, which is an excellent return on a $11,000 investment.

X X X

Safety Alarm on Frigidaire Control

By JACK JOSEPHSON, Bridgeport, Conn.

THERE are many commercial installations located in remote sections where the water supply to the condenser is subject to interruption caused by freezing, plugged lines, drops in pressure, etc. While the machine in such cases is protected against damage by the high pressure cut out, there is always the possibility of food spoilage if the condition is not noticed and the refrigerator is allowed to remain idle too long.



FRIGIDAIRE ALARM

An alarm such as shown in Fig. 1 will pro-

vide adequate warning of such conditions on the Frigidaire units equipped with the old style control which employ weights for adjusting the operating pressures. An ordinary doorbell, transformer and push button are the only materials needed.

SERVICE KINKS

Tools and Equipment You Can Build

Under this heading will appear simplified or short cut methods of performing individual service operations; also details of how you can build special tools and equipment for your own use. Readers are invited to submit information for publication under this head.

A Triple Purpose Pump

TO be thoroughly equipped with pumps suitable for the different jobs they must perform the service shop should have three different types apart from the usual air compressor.

The first of these is an evacuating pump to be used for pumping out the old refrigerant and oil from the system prior to overhauling or cleaning and recharging. This type of service has always been a difficult one to meet, with the ordinary type of vacuum pump because of the moisture and acid contained in the old refrigerant which will gum up the compressor within a short period of service.

To properly handle the job it requires a pump which at all times is submerged in some liquid or, if possible, is so arranged that the old refrigerant never comes in contact with it.

A second pump is required as a vacuum pump which should be capable of pumping 29 inches or more of vacuum. A pump must always be in first-class condition for this type of service and must be thoroughly protected from moisture and corrosion. Its cost

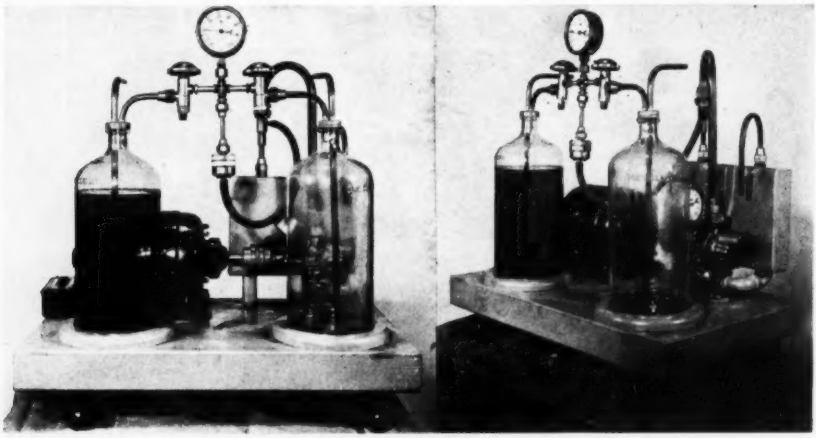


FIG. 1—TWO VIEWS OF THE PUMP

of operation must be reasonable since it will be required to operate for periods of ten hours at a time while drying out systems in the bake oven.

The third pump needed is a liquid circulating pump to be used for circulating acids or solvents when cleaning coils or entire systems. Here again it is desirable to provide some method with which the cleaning solution does not come into contact with the pump,—particularly when acids are used.

Most shops are equipped with at least one of these pumps and many have two of them, but there are very few equipped with all three. The probable reason is that most shops do not have sufficient work of a nature requiring all three to make the investment worth while. If, however, it were possible to combine all the desirable features of all three pumps into one unit, the service shop would not be required to invest in more than one while at the same time having the convenience of all three when needed.

The apparatus described in the following provides all of these conveniences and in addition, provides portable equipment capable of drawing a 29-inch vacuum, and small enough to carry in the tool kit for transportation to the customer's premises.

The apparatus as shown in Fig. 1 may be divided into two separate sections since each may be used independent of the other. The first of these sections is the pump, the nucleus of which is the vacuumator manufactured by the American Injector Co., of Detroit, Michigan.

These injectors provide an ideal means of evacuating a system and of pulling a vacuum. They operate on water at 25 or more pounds pressure and are capable of pulling a 29-inch vacuum. Due to their small size and the ease with which they can be carried, they are particularly useful for short period service on the customer's premises where water is available. For long period service, such as required during oven drying processes, the cost of water where it is metered would be quite high.

In order to make the device self-sufficient, depending only on electric current, a ¼-hp. motor and a gear type brass pump capable of handling 250 gallons of water per hour at 25 pounds pressure is used to recirculate the water required by the vacuumator. A water reservoir into which the vacuumator discharges the water, and from which the

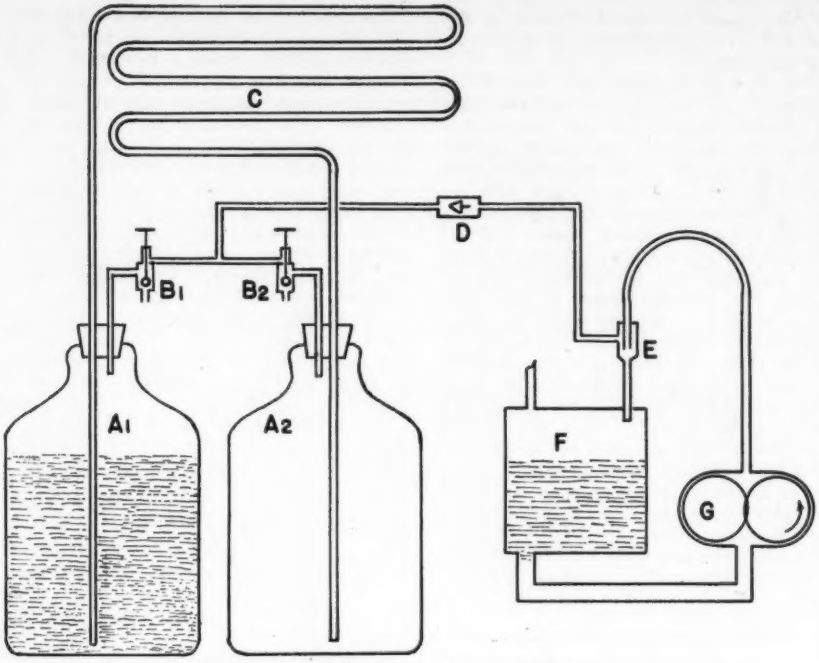


Fig. 2—Schematic diagram of pump and system

pump receives its supply, is mounted near the pump. The tank shown in this demonstration unit is too small for practical use over a long period because of the heat generated in it through friction. A tank of about two gallons capacity would permit more time for cooling of the water before being recirculated.

A check valve should always be used in the suction line to the vacuumator to prevent water from backing up into the space being evacuated.

The balance of the system, consisting of the two glass bottles and the connecting tubing and valves, provides a means of circulating acids, solvents or any liquids without the liquid coming in contact with the pump. Because of this fact, any type of pump may be used to provide the vacuum. Also, by substituting steel containers for the glass bottles, pressure may be used to circulate the liquid, thus getting as much pressure as desired.

Details of both the pump and the circulating system are shown in Fig. 2. The glass bottles are one gallon size and the two valves, B_1 and B_2, are Imperial compressor valves with hand wheels added to them.

When the cleaning solution is in A_1, B_1 is turned all the way in and B_2 all the way out. With the valves in this position air is permitted to enter. A_1 and a vacuum is drawn on A_2. The cleaning solution is drawn through the coil to be cleaned and into A_2. By reversing the valves the solution will be drawn back through the coil to A_1. The operation of the valves may be continued and the solution passed through the coil as many times as needed to properly clean. A visual indication of the dirt being removed is provided by the glass bottles.

By keeping the various cleaning solutions in the same type of glass bottles and exchanging bottles on the system, there will be little inconvenience in handling solvents and acids.

The customary blowing out and drying of the coil is, of course, necessary after the washing operation is completed.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

SERVEL MODEL 13-A

QUESTION 352: In replacing a new float in a 13-A Servel header, and after putting the unit back into service, I discovered that the last four coils around the ice trays would not freeze.

As the liquid enters the evaporator passing the needle, it passes around the trays and then enters the header on the back side. The first five coils of tubing and the header freezes, but the last four coils before it enters the header do not freeze. Where the liquid enters the header is about half way up and the way the float is calibrated the level of the liquid is just below this inlet. Is that the correct level for this particular type of float, or should the level of the liquid be above this inlet? Or, is there something else that is wrong that is causing this trouble?

ANSWER: I believe the calibration of the float on the Servel model 13-a is correct and that the liquid level should always be slightly lower than the point where the liquid enters the header.

The fact that the last few coils do not frost is probably due to the location of the feeler bulb of the thermostat. I believe if you will move this bulb back to within the last two or three coils you will overcome your trouble.

Then, again, the trouble might be due to the temperature setting of the thermostat or possibly a third cause would be insufficient

refrigerant. This last, however, should be easily detected by the fact that the machine would run continuously and frosting would be comparatively slight throughout the entire length of the coil.

MILLS HARDENING CABINET

QUESTION 353: Can you help me out on a Mills Ice Cream Maker and Hardening Cabinet, 1935—Model 26—Ser. 527?

Customer's complaint: Water running out on the floor from cabinet. Looking under the cabinet I found drops of water all over the bottom and on the end next to compressor compartment. Compressor is in the basement. My check-up indicated condensation. There are about two inches of space between the bottom of the compressor and the floor. Would it help to fill this space with rock wool insulation?

Does this job contain brine?

What is the proper or correct temperature for the hardening cabinet?

Would cutting down the expansion valve help?

ANSWER: The holdover solution in the Mills hardening cabinet is contained in the three ice slabs of the cabinet, one in each side of the cabinet and one in the center of the cabinet. This holdover solution is a low grade paraffin oil, such as Standard Flushing, Dionne, or any other type of oil.

The recommended temperature for the Mills hardener is from minus 18 degrees to minus 24 degrees. This, of course, depends on the butterfat content of the mix being used—the higher the butter-fat content in the mix, the lower the temperature necessary.

With regard to condensation on the bottom of the hardening cabinet, your letter states that this condensation forms on the bottom of the hardening cabinet at the compressor's compartment end. This leads us to believe that the Kapok insulation at this end of the hardening cabinet has broken down. The tubing connecting the three ice slabs is at this end of the cabinet, and undoubtedly the moisture from the defrosting of these tubes has soaked the Kapok and is dripping through the insulation on the bottom of the cabinet.

This condition should be corrected as soon as possible, or the whole bottom of the hardening cabinet will become broken down and will necessitate a complete re-insulation job on this particular part of the cabinet.

The only other thing we can figure that would cause this condensation is that your customer defrosts and washes out the cabinet and in doing so uses too much water and floods the bottom of the cabinet to a point where the water reaches the top of the bottom pan and overflows into the bottom insulation slab. This, however, is problematical, as these hardening cabinets are defrosted so seldom that it would take considerable length of time before a condition like this would make itself known.

We would suggest that the Kapok in the freezer and hardening cabinet be changed; this is a very simple operation and will probably correct the condition. If you follow the following suggestions you should not have any trouble:

Remove the two screws from the top of the inside enclosures, bend these forward into the hardening cabinet, and remove all old Kapok. Repack very tightly again with fresh Kapok, and then close your plates back into position and replace screws.

The recommended control setting on this particular job is in at zero pound pressure and out at 18 inches of vacuum. The suction line of the hardening cabinet should have a permanent frost-back of approximately 8 inches on the outside of the cabinet.

REWINDING HERMETIC MOTORS

QUESTION 354: I am writing for information on rewinding motors on hermetic units. I have rewound several motors but not for hermetics. The information I am needing is this,—are the windings dried in an oven, then varnished and baked, or just dried out? I have all copies of THE REFRIGERATION SERVICE ENGINEER since 1935 and some writers state the motor windings should be varnished and baked. I do not believe any of the varnishes that I am using would be suitable for such work. If there is a varnish used for this purpose, please furnish me the name and also where it may be obtained. I have noticed that all articles appearing in your publication do not agree on this subject,—some state the windings should be varnished and baked, while others do not.

ANSWER: Rewinding of motors on hermetic units is somewhat different to what it is on open type motors, and there are additional precautions necessary to take.

No varnish or shellac is used on hermetic motors for the reason that this may dissolve or chip off causing small particles to enter the refrigerating system and clog fine screens. It is the usual practice to use a double covered de-linted wire, and special

care must be used while winding to prevent lint from being ruffled so that when the machine is in operation the lint will not be washed away from the winding, causing screens and small orifices to become clogged. Baking of the winding is not necessary since all hermetic units must be thoroughly dried and baked in an oven before assembly, so that the moisture may be removed from all parts of the system. Naturally, the winding will become thoroughly dried during this process.

INCREASING CONDENSING CAPACITY

Question 355: Do you believe that using a small fan blowing on a household refrigerator condenser would improve its efficiency in extremely warm weather? The job I have referred to is a Universal Cooler with a brine tank evaporator and in very hot weather it runs for long periods of time.

Also, would a small fan blowing on the compressor do much good, as it too gets pretty hot during these long runs.

Answer: Using a small fan blowing on the condenser of the refrigerator, and on the compressor would probably help to some extent during the extreme warm weather. However, I am not sure whether it would warrant the additional expense of a fan and motor. I would think that improving the condition of such things as the condenser, or, in other words, cleaning the outside of the condenser, improving the existing fan on the motor so that it supplies a greater volume of air, installing a new door gasket on the refrigerator, and if possible, drying out the insulation in the cabinet, would do considerably more good.

Undoubtedly, the refrigerator is rather an old model since you state it is using a brine tank evaporator, and it is quite often that we find such refrigerators are fairly well moisture-soaked through the insulation, which causes a greater load on the compressor.

One other thing that helps such situations, and which you might be able to arrange if convenient, is to install a heat exchanger between the compressor and the condenser permitting the hot gas to pass through the exchanger where ordinarily the suction line would be connected, and connecting the other two outlets to a supply of water, thereby providing the machine with a partially water-cooled system. The water, of course, need only be used during the extreme hot weather.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

Official Announcements of the activities of the National Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

R.S.E.S. CONVENTION ALL SET

AS this issue goes to press the refrigeration industry is turning its attention to Chicago where the activities of the 6th Annual Convention of the Refrigeration Service Engineers Society being held in conjunction with the 2nd All-Industry Refrigeration and Air Conditioning Exhibition—January 15th to 18th—at the Stevens Hotel, will be in full swing.

One of the most interesting educational programs has been arranged for the Society's meetings, and together with the large representative exhibit of refrigeration equipment by the principal manufacturers in the industry the convention will provide an intensive four-day study in latest refrigeration developments.

OFFICERS OF LADIES AUXILIARY
Left to right are: Mrs. C. Brunton, *President;* Mrs. V. Black, *Secretary;* Mrs. J. Salter, *Director,* and Mrs. E. Seaton, *Sergeant-at-Arms.*

GAY 90's WILL FEATURE R.S.E.S. PARTY

REMINISCENT of the gay 90's will be the big party to take place on Wednes-

MEMBERS OF THE LADIES' CONVENTION COMMITTEE
Left to right front row are: Mesdames E. White, R. H. Luscombe, M. W. Knight, D. H. Daskal, A. B. Stickney, J. McQuan. Rear row: D. Perham, T. C. McKee, W. Stafford, H. W. Blythe, I. Alter, A. Kreuger.

day evening during the convention, in the Boulevard Room, starting at 9 p.m.

This party, sponsored by the Refrigeration Service Engineers Society, will lay aside all formality and will take you back to the gay days of the early 90's. It will be a party you will not want to miss, and tickets will be included in the paid R.S.E.S. registration fee.

Art Goldsmith and his Casino Orchestra, direct from the Ambassador East Hotel, will furnish the music, and novelty acts carrying out the theme of the 90's will provide the entertainment throughout the evening.

It will be the meeting place for the refrigeration industry on Wednesday evening. Everyone is invited to attend.

* * *

"BADGERITES" INVITED TO WISCONSIN HEADQUARTERS AT CONVENTION

THE Wisconsin Association, comprising the various chapters of the R.S.E.S. in Wisconsin, will have a special room at the Stevens Hotel where all members of the Society and other refrigeration service men residing in Wisconsin are cordially invited to make their headquarters and use it for a central meeting place.

The location of the Wisconsin room will be placed on the bulletin board, and every Wisconsin refrigeration service man is requested to register at the Wisconsin headquarters.

* * *

GOLDBERG'S ANNUAL PARTY

AS usual Herman Goldberg's annual Christmas party was a huge success. The party this year was held December 18, in the North Ballroom of the Stevens Hotel. Over 650 persons from all branches of the industry attended.

The evening opened with several very entertaining acts of vaudeville including dance teams, singing impersonators, magicians, etc. Dancing followed the entertainment and an intermission during the dancing was utilized by Mr. Goldberg for the showing of movies taken by him at various R.S.E.S. functions.

Two door prizes for the evening were won by A. Brown of Rex Refrigeration Co. and N. M. Miles of Goldenrod Ice Cream Company. An old-fashioned waltz contest was won by R. R. Dunlop, Ranco Inc., and Mrs. J. B. McGuan. A Jitterbug Contest award went to Fred Olds of Rex Refrigeration Co.

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

MICHIANA CHAPTER

December 14th—The chapter held its banquet at the Oldenberg Inn, South Bend, Indiana, with an attendance of twelve members, their wives and friends. The honor guests were Mr. Willis Stafford of Aurora, Illinois, and Mr. Gene White of Hammond, Indiana, national directors for this district. Mr. Stafford outlined the plans for the national convention and invited everyone to attend, and Mr. White summarized the outline.

The evening's entertainment was exceptionally well presented by Mr. Billy Zerbe, who presented two acts, twelve minutes of nonsense and "A Fire and Brimstone Sermon." Mr. Zerbe is one of the original end men of the Field's Minstrels and has traveled with minstrel and vaudeville acts for many years.

The remainder of the evening was spent playing bingo, with first prize being won by Mr. Bryan of Plymouth, Indiana; second prize by Mr. R. K. Gill of Mishawaka, Indiana, and third prize by Mrs. G. Minzey of Mishawaka, Indiana.

At the end of the evening the door prize was awarded to Mrs. H. Zerbe, and believe-it-or-not, much to the dismay of his wife, Mr. Zerbe cut the tickets, numbered them, and then Mrs. Zerbe drew her own ticket from the box.

December 19th—The annual election of officers was held on this date and the following were elected or re-elected: *President,* J. A. Pechi; *Vice-president,* J. F. Woveris; *Secretary,* L. E. McKee; *Treasurer,* E. E. Ullery; *Sergeant-at-arms,* H. F. Bryan.

ONTARIO MAPLE LEAF CHAPTER

October 27th—A regular meeting of the Ontario Maple Leaf Chapter was held at the King Edward Hotel, Toronto, with about eighty members in attendance which included all of the officers of the chapter.

Several items of business were at first discussed in detail and were voted on by the membership. The President, Ken Wood, advised that all program arrangements had been made by the committee for the holding of a joint meeting of the Niagara Frontier Chapter of Buffalo; the Ontario Forest City Chapter of London, and the Mount Royal Chapter of Montreal, along with the Ontario Maple Leaf Chapter as guests at the Royal Connaught Hotel in Hamilton on November 10th. Such a program had been made possible through the courtesy of Kelvinator of Canada, Ltd., who had so kindly cooperated with our Educational Committee in making arrangements for the speaker of the evening and the lunch and refreshments.

President Wood then reported the formation of a new chapter in Ottawa to be known as the Canadian Capital Chapter, and advised that this had to a large extent been possible due to the efforts of members of the Ontario Maple Leaf Chapter, including G. A. Burns and others, and particularly complimented Harry Parish on his interest and efforts in support of the R.S.E.S. who had personally conducted a meeting in Ottawa to aid the new chapter in getting away to a good start.

At the close of the business session Bert Nye then introduced the guest speaker of the evening, Mr. J. Armstrong, of the Dole Company. Mr. Armstrong gave a most interesting and instructive talk on Doleco plates and cooling by conduction, after which he entertained those present by the showing of two films he had brought with him. The appreciation of the membership was shown in the usual manner.

At the conclusion of this educational feature, our Entertainment Committee Chairman, Bert Nye, on behalf of the Railway and Engineering Specialties, invited those present to partake of sandwiches and beer.

Views of the International meeting at Hamilton, Ont., Canada.

November 10th—This meeting of the Ontario Maple Leaf Chapter was held at the Royal Connaught Hotel in Hamilton and was called "International Night" inasmuch as it was held jointly with good representation from the Niagara Frontier Chapter of

Buffalo, the Ontario Forest City Chapter of London and the Mount Royal Chapter of Montreal. There were some one hundred thirty-five members present at this meeting.

The meeting was called to order at about 9 p.m. with President Ken Wood in the chair, who spoke at this special time and expressed greetings to all present and a special appreciation to members of the other chapters present for their co-operation in making such a meeting possible. He also welcomed all guests present on behalf of the Ontario Maple Leaf Chapter and hoped that they would enjoy their evening.

Secretary Frank C. Strong then read the minutes of the last regular meeting of the Ontario Maple Leaf Chapter, which were duly approved as read.

President Ken Wood then introduced the National Vice-president of the R.S.E.S., our own Gordon Burns. Mr. Burns responded with an interesting short talk on R.S.E.S. activities from its inception. He covered in brief its developments, particularly its growth in Canada.

President Wood then expressed appreciation at the attendance of the delegates from the Buffalo Chapter who came at least a dozen strong, including their President, G. O'Hara, and their Secretary, S. Szyszkowski. They were provided with seats at the head table along with the guest speaker, Mr. G. Graff of the Ranco Control Company, and Mr. G. A. Burns, National First Vice-president; Mr. Alex Dawson, Chairman, Educational Committee of the London Chapter; Mr. L. J. Boucher, President of the Mount Royal Chapter, Montreal, and one or two others.

Mr. Bill Marshall, our genial Chairman of the Educational Committee, took a couple of pictures of the meeting, after which Alex Dawson addressed the meeting expressing his pleasure at being present, and before sitting down he introduced Mr. G. Graff, the speaker of the evening.

The meeting was then taken over by the President of the Ontario Maple Leaf Chapter, Ken Wood, who read a telegram which had just been received from Mr. G. W. Blay, of Kelvinator of Canada, Ltd. Mr. Blay expressed his regret at his inability to attend our meeting and went on to express good wishes of Kelvinator for the success of the meeting and the R.S.E.S., and on behalf of his company invited the assembly to partake of sandwiches and beer which they had provided.

The meeting then adjourned with the singing of "God Save the King," and all present enjoyed refreshments, the singing of songs and impersonal discussions until a late hour. Harry Parish officiated at the ivories and a not-in-the-least-appreciated number was "Alouette" rendered by our friend, Mr. L. J. Boucher of Montreal.

November 24th—A meeting was held at the King Edward Hotel, Toronto, with some sixty-five members and visitors present. Six new members were accepted into the chapter.

Many matters of business were discussed, including the question of choosing of delegates to the National Convention. A favorable financial report was given by the Treasurer.

The Canadian General Electric Company presented the chapter with a Halide Leak Detector to be raffled as a door prize at our next meeting.

The speaker of the evening was Mr. Paul Penn, of the Penn Automatic Controls, Goshen, Indiana. He gave a fine illustrated talk on the products of his company and presented all members with jacket screw drivers.

CENTRAL ARIZONA CHAPTER

December 19th—This meeting took the form of an open social meeting rather than a business meeting, and because of the large number of visitors present, Mr. Fred Clayton gave an interesting talk on the aims and purposes of the Society, and some of the benefits to be derived from membership therein. A motion was made and carried that all business for the evening be dispensed with, after which the President asked Mr. Seigmund to say a few words regarding membership in the Society.

Mr. Corrigan, of the Registrar of Contractors Office, spoke at some length on the difficulties encountered within his department in seeing that all those engaged in contracting work were properly licensed, or that they were entitled to a license. He gave rather a comprehensive outline of the routine work done by his office and some of the work it accomplishes.

Mr. Mel Reese talked on the safety and benefits of insurance.

Entertainment followed in the form of singing by Amos Terrill, accompanied on the piano by his accompanist Dolly Dodd.

Mr. Marvin Smith, of the State Legislature, was introduced and presented some interesting information on the procedure of passing bills within the Legislature.

Mr. R. L. Darby, a member of the National Board of Directors, was then introduced and was asked to address the meeting. He gave the chapter some very useful information regarding activities of the National Society, and helpful hints on conducting a local chapter. After his talk, Mr. Carl White presented Mr. Darby with a cowboy hat and handkerchief.

The entertainment continued with a skit depicting a family scene in an average kitchen. The scene opened with Papa phoning Mama, and during the conversation he was given the grocery list. Mama seemed to be in trouble at the time due to difficulty with the refrigerator. Papa came home and together they searched through old bills to obtain the phone number of a service man. Considerable ribbing was given each member of the chapter during this part of the scene, but finally a service man came and started to work. After considerable noise and a lot of humorous mishaps the box was made to work, and after some difficulty, Mama and Papa were convinced that the box would continue work and the service man was then able to collect his money. In consideration of the fact this little play was not rehearsed, and was composed of local talent, it was considered exceptionally good and the chapter is now making plans for more such plays in the future.

LONG BEACH CHAPTER

December 7th—The meeting was called to order by President Voepel at the Willis Refrigeration Service Company, and after the roll call of officers and reading of the minutes of the last meeting, the President read a letter from the National Secretary regarding appointment of a delegate to the National Convention. The Secretary was instructed to write the City Manager, expressing the approval of the chapter in the reappointment of expiring members of the Examining Board. Mr. Allen and Mr. Gould spoke briefly on the proposed changes in the city refrigeration ordinance.

Refreshments of cake and ice cream were served following the meeting.

December 9th—The Long Beach and San Diego chapters met at San Clemente Social Hall in San Clemente, California, just halfway between each city, for a dinner dance. Tickets were sold by both chapters and a turnout of forty couples partook of a turkey dinner served by the local Eastern Star of San Clemente. Mr. Gould, of Long Beach Chapter, was master of ceremonies and introduced the officers of both chapters, after which, each member introduced himself and wife. The Mayor of San Clemente, the Hon. Mr. Dan Mullheron, gave an address of welcome to the Society on behalf of the city.

Mr. Crofoot, a Long Beach member, gave a talk on the history of San Clemente over the microphone, after which dinner was served.

After dinner, Whistling Sam's five-piece colored orchestra played for dancing until 12:30 a.m. During the lull in dancing four door prizes were given by courtesy of the wholesale houses of each city. The hall was very nicely decorated with Christmas tree and lights. A good time was had by all and everyone hopes for a larger party next year.

ST. LOUIS CHAPTER

December 14th—The members and many

of their friends assembled at the plant of the Marlo Coil Co., where they were taken on a tour of inspection by Mr. Pellegrini. Every step in the coil manufacturing process was explained in detail and special stress was laid on the painstaking effort, precision workmanship, exhaustive tests and general engineering necessary to make a quality product worthy of the company's name.

After this leisurely tour, refreshments, consisting of beer, pretzels and potato chips, met with unanimous and gustatory delight, and to top it off, cigars were passed out in abundance.

December 28th—The Nominating Committee's report was received, but due to the small attendance, caused in part by the inclement weather and hazardous driving conditions, it was decided to hold over the election until January 11th.

This not being possible in regard to the delegate and alternate delegate, as their credentials had to be in before January 5th, it was decided to elect them at once, and defray the delegate's expense to the sum of eighteen dollars. This amount to revert to his alternate in the event the delegate was unable to attend. The delegate elected was Secretary Plesskott, and his alternate, past-president Vollmann. There were no special instructions at this time.

President Huhn then presented to the past presidents present, E. A. Plesskott and L. L. Vollmann, on behalf of the Chapter, suitably engraved R.S.E.S. buttons, expressing his thanks for their work during his year as presiding officer, and voicing the hope that this small token be the means of spurring them on to further efforts for the good of the Society in general, and St. Louis Chapter in particular.

MADISON CHAPTER

November 14th—Mr. Noth gave an informal report or survey of the national conventions he had attended. He cited some of the educational features and some of the parties.

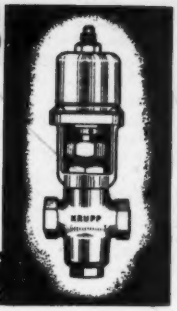
Mr. C. Buschkopf gave a report of Illinois State meeting.

Mr. Harold Struthers gave a talk on the automatic expansion valve.

TWIN CITY CHAPTER

December 5th, was the night of the Fun Festival held at Granville Hall in Minneapolis. Vice-president B. J. DeLange turned the evening over to Mr. C. A. McCafferty, Chairman of the Entertainment Committee, who acted as master of ceremonies, and immediately started the show.

First on the program was a dance team, Betty and Bob Heidelberg, ages 8 and 10 years respectively, who presented a very clever tap dance. An act by Harry Alerton



and his trained dog followed, and then a wrestling match put on by local talent, and which proved to be the hit of the evening. Mr. H. E. Schaeffer took the part of the champion, challenging anyone in the audience, while Mr. A. M. Palen took the part of the disorderly drunk and accepted the challenge. After a good deal of comedy the match was declared a draw and the audience was left holding their sides with laughter.

A spelling bee in which the entire attendance took part provided a great deal of entertainment. The amounts of ten to twenty-five cents were paid for the spelling of designated words.

A kangaroo court, in which one of the members was arrested by the Sergeant-at-arms, charged with having said he was not having a good time, proved to be an entertaining feature.

December 12th Meeting

December 12th—The meeting was called to order by Mr. A. G. Larson and later taken over by Vice-president B. J. DeLange. Mr. Otto Chermak and Mr. Eugene Coulter were accepted to membership and welcomed to the chapter. A vote of thanks from the chapter was extended to Mr. C. A. McCafferty and his Entertainment Committee for the work they had done during the past year.

After report of the Nominating Committee was read, it was recommended that the present officers, with the exception of president, be re-elected by unanimous vote and in accordance, a blanket nomination for all such officers who held office during the past year was made and passed. An election was conducted for the purpose of selecting a president, which resulted in Mr. Wm. V. Warner being elected.

MISSOURI VALLEY CHAPTER

October 5th—This was the first meeting since the summer adjournment and there was therefore considerable business to be transacted, being an accumulation of the summer months. Certificates of Proficiency for five members, and membership cards and certificates were distributed to those having paid their dues to date, and Mr. Beckner volunteered to contact the World Herald with a view to securing an announcement in their paper regarding the next meeting. The resignation of Mrs. P. O. Jones, who stated she was no longer connected with the refrigeration industry, was read and accepted.

Public Relations

Mr. Doyle, Chairman of the Publicity Relations Committee made a report on his activities and a general discussion followed regarding steps to be taken on the adoption of a refrigeration code in Omaha.

Mr. Jess Hart was appointed to complete the unexpired term of Mr. Austin Jones as Chairman of the Educational Committee. Mr. Jones is no longer located in Omaha.

Mr. Colgate of Ruegg Supply Company presented a short talk.

WICHITA CHAPTER

December 15th—The meeting was called to order by President Ryan, and after regular routine of business was conducted, Mr. Sullivan of the Fairbanks Morse Company, a visitor of the evening, was introduced by President Ryan.

It was suggested that a dinner meeting be held on January 5th, which is the date of the next regular meeting. At this time the election and installation of the new officers would take place, and it was felt that some entertainment should be provided and the meeting thrown open to both the ladies and men. Mr. Edwin T. Quinn was appointed as Chairman of the Committee on arrangements.

PITTSBURGH CHAPTER

December 8th—The reading of considerable correspondence was the first order of business, among which was a complete outline of things to be expected at the forth-

coming National Convention.

The educational portion of the program for the evening consisted of Mr. C. V. Hale and Mr. H. S. Stockdale presenting a sound film to an appreciative audience. These two gentlemen were thanked by Mr. Black for their presentation.

Following this feature, Mr. John Barbagallo was appointed delegate to the National Convention, and Mr. Guy Croston, alternate.

OFFICERS OF PITTSBURGH CHAPTER

An election of officers followed with these results: *President,* S. C. Perry; *Vice-president,* A. H. Ross; *Secretary-Treasurer,* F. V. Golitz; *Sergeant-at-arms,* H. A. Biber; *Educational Chairman,* N. D. Wagener; *Board of Directors,* E. V. Black, John Kirch, John Barbagallo.

Mr. Black then turned the meeting over to the new President, Mr. Perry, who asked for a rising vote of appreciation to the retiring officers.

MONTGOMERY CHAPTER

December 17th—This meeting was devoted to the election of officers and the following were elected: *President,* Milo Howard; *Vice-president,* Harry M. Burke; *Secretary-Treasurer,* J. M. Gantt. This was followed by the appointment of the following committees: Business Committee, W. C. Goodwin, Cecil Steward, H. H. Rawlinson; Entertainment Committee, J. H. Ruse, C. C. Collins, S. B. Goodwin.

BOSTON CHAPTER

December 11th—Considerable time was devoted to discussion of the meeting which is being planned with the Springfield and Worcester Chapters, and further discussions regarding ways and means of supplying expenses for the delegates to the National Convention. It was decided that the President be appointed delegate and if possible part of his expenses should be paid.

A Nominating Committee was elected and instructed to present their selection at the

next regular meeting in January, at which time an election of officers would take place.

The balance of the evening was devoted to refreshments and local entertainment.

MISSISSIPPI VALLEY CHAPTER

December 8th—The meeting was called to order by President Leonard Nelson, who dispensed with as much business as possible so that the balance of the evening could be given as much time as possible.

A discussion regarding a forthcoming bus trip to Iowa City to inspect the State University's refrigerating and heating plant proved to be interesting.

Following this business session, Mr. Willis Stafford, a member of the National Board of Directors, was introduced and spoke briefly on the forthcoming National Convention program and general information regarding the activities of the National Society.

Following Mr. Stafford's talk a stag party took place, at which refreshments were served and considerable entertainment was provided.

TRI-COUNTY CHAPTER

November 17th—The members of the chapter entertained their wives at a very nice dinner meeting on this date. Following the dinner, President Metcalf introduced the speaker of the evening, Mr. W. E. McCinney, of the American Air Lines. Mr. McCinney presented a motion picture showing the advancement made in aviation during the last decade, and following the picture Mr. McCinney answered many questions and presented some interesting information on aviation. This program proved very interesting and educational to both the ladies and men present.

December 1st—The meeting was opened by President Metcalf and he immediately turned it over to Mr. Lawrence Millen who took charge of the presentation of the General Electric unit supplied by the National Society. A general discussion followed and the attendance prize was drawn and won by Harold Erickson.

DAYTON CHAPTER

December 5th—After the usual routine of business was conducted an election was held for the purpose of selecting delegates to the National Convention, with the result that Mr. G. G. Orsborn was elected delegate, and Mr. G. W. Perrine elected alternate.

Announcement was made that at the next meeting the annual election of officers would take place.

CENTRAL INDIANA CHAPTER

December 7th—In the absence of the President, the meeting was called to order by Vice-president Sevy, and Mr. Pop Rogers acted as Secretary due to the absence of the Secretary, Mr. Vern Nold, on account of illness. The Secretary was instructed to look into the possibilities of purchasing a motion picture machine for the chapter, and was instructed to have as much information as possible available for the next meeting.

PHILADELPHIA CHAPTER

November 13th—The meeting was held at the Jourdan School with eleven members present and President Grant presiding.

Mr. Gaspari introduced Mr. Hauptly, who lectured with the aid of a blackboard for over an hour on the cycle of refrigeration gases. Mr. Keers made a motion that a vote of thanks be given Mr. Hauptly for his interesting talk, and this was seconded by the entire body, in form of letter.

December 11th—This meeting night was devoted to the election of permanent officers and to the presentation of the chapter charter. The meeting was called to order in the Jourdan Trade School in Philadelphia, and due to the fact that the occasion presented an opportunity for many old friends to renew their acquaintanceship, the meeting did not get under way until 9:30 p.m., at which time the election of officers took place and all temporary officers previously elected were re-elected to permanent office for the coming year.

Mr. Paul Jacobsen, Past National President, was then introduced and he proceeded with the charter presentation ceremony. The ceremony proved to be very interesting and impressive.

Following this presentation several reels of motion pictures presented by the Ford Motor Co. were shown. One of these showed the process of making safety glass. Another, the tests and checks made on material and cars in their plant. A third picture was of Yellowstone National Park, and the last of scenes in Glacier National Park.

MADISON CHAPTER

December 12th—After the regular order of business was conducted, Mr. Phil Noth was elected as delegate to the National Convention and Mr. Harry Streich elected alternate. The President then appointed a Nominating Committee, consisting of Otto Johr, Ray Carlson and Red Struthers, with instructions to make their selections and have them ready for the next meeting at which time the annual election of officers would take place.

The educational program of the evening consisted of a discussion on the Nizer unit.

CENTRAL INDIANA CHAPTER

December 19th—The meeting was called to order by Vice-president Sevy, and two new members were welcomed into the chapter. A goodly representation was present for the evening and the Question Box proved so interesting that the meeting did not adjourn until a late hour.

Mr. Herbert Hale, of Kokomo, was elected delegate and Mr. Vern Nold, of Marion, alternate, to the National Convention in Chicago.

DAYTON CHAPTER

December 15th—After the regular order of business was disposed of the annual election of officers took place, with the following results: *President,* R. J. Brown; *First Vice-president,* Geo. Click; *Second Vice-president,* J. R. Klopper; *Secretary,* G. O. Snyder; *Treasurer,* L. E. Brumfield; *Educational Chairman,* H. R. Shoupp; *Sergeant-at-arms,* Lincoln Dennis; *Board of Directors,* R. F. Yauch, O. S. Waid, G. G. Orsborn.

TRI-STATE LADIES' AUXILIARY

December 10th—The ladies of the Tri-State Auxiliary and their husbands met at the home of Mr. and Mrs. Harrison, Ashland, Kentucky, for a turkey dinner and Christmas party. After a very delicious dinner, the men retired for a short meeting while the ladies chatted. Later, when the men rejoined the ladies the passing party took place and we all opened our gifts. We then engaged in a number of games, under the supervision of Mrs. Gruber. Mrs. McElhaney then entertained us with a few monologues, after which speeches were made by the following: Mr. Brunton, Mr. Harrison and Mr. McElhaney.

In recognition of the residents of the local chapter, a combination waffle iron and sandwich grill was presented to Mr. and Mrs. Gruber, by Mrs. Poole, on behalf of the Society and Auxiliary.

After indulging in a "light" supper (consisting mostly of pie) the party dispersed and each departed to their respective homes, having spent an enjoyable afternoon and evening.

S S S

MODERN ANNOUNCES REGIONAL SALES MANAGERS

THE Modern Equipment Corporation of Defiance, Ohio, announces that four Regional Sales Managers have been appointed, effective immediately.

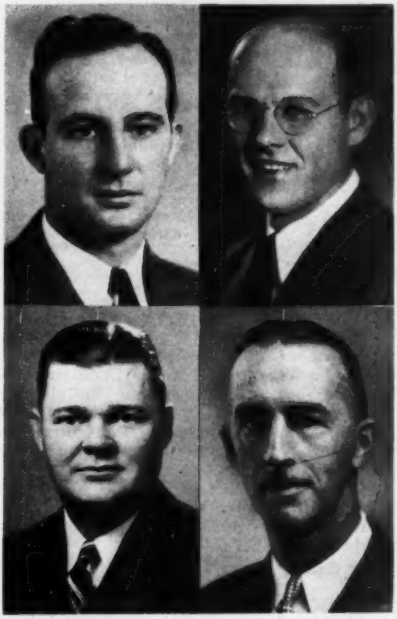
Modern has divided its selling field, which includes the entire country, into four regions,

or zones, each of which will be under the supervision of one of the new managers.

Zone 1, which will include Northern New Jersey, New York and the New England States, will be under the supervision of Mr. M. E. Draudt, with headquarters in New York City.

Zone 2, which will include Pennsylvania and the Southeast, will be under the supervision of Mr. M. H. Battenhouse, with headquarters in Pittsburgh, Pa.

Zone 3, which will include the Middle Western States, will be under the supervision of Mr. W. C. White, with headquarters in Chicago, Ill.



M. E. DRAUDT and M. H. BATTENHOUSE above. W. C. WHITE and L. M. SNELL below.

Zone 4, which will include the Southwest and the far West, will be under the supervision of Mr. L. M. Snell, with headquarters in Kansas City, Missouri.

This zoning, according to W. C. Allen, general sales manager, was made for the purpose of furthering the company's policy of close cooperation between the company and its customers and users.

The Modern Equipment Corporation are manufacturers of the well known Par refrigeration condensing equipment.

FEDDERS CLIP-ON THERMOMETER

A NEW convenient Clip-On superheat thermometer is announced by Fedders Manufacturing Co., Buffalo, N. Y.

This specially designed thermometer makes it possible to accurately check superheat of direct expansion air conditioning coils at suction end of each circuit of coil thus assuring correct setting of each Fedders Individual Refrigerant Flow Control Valve for maximum efficiency throughout the entire coil.

Fedders Clip-On thermometer provides accurate check of setting and operation of thermostatic expansion valves for superheat, and temperature of high-pressure liquid entering expansion valve can also be checked.

FEDDERS NEW THERMOMETER

This combined with head pressure and reading of coil temperature makes it a simple matter to determine amount of liquid to produce each ton of refrigeration.

Fedders Clip-On superheat thermometer is a strong, serviceable self-contained instrument which can be instantly clipped on to tubes. Thermometer tube is adjustable for easy reading from any angle.

Bulletin 392-A tells the Fedders Clip-On superheat thermometer story in pictures.

L. B. MILLER NOW WITH PERFEX

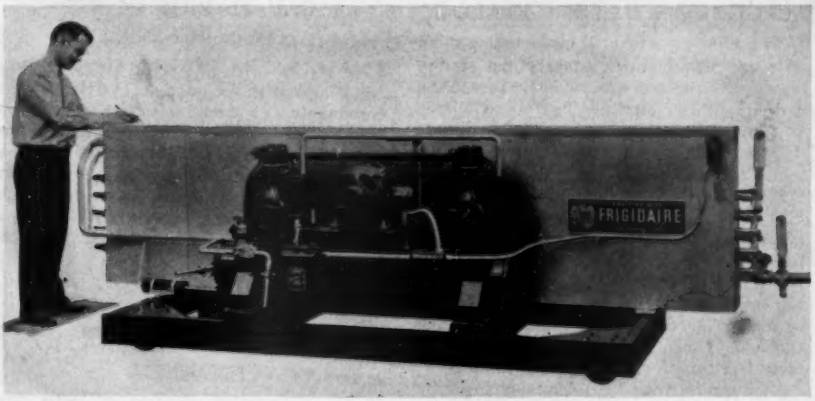
THAT L. B. (Pat) Miller has joined its Automatic Control Division in a sales executive capacity is announced by the Perfex Corporation, Milwaukee, Wisconsin.

L. B. MILLER

"Pat" is one of the pioneers of the control industry. With E. N. McDonnell, he founded the firm of McDonnell & Miller, manufacturers of low water cut-offs, in 1924. When he sold his interest to Mr. McDonnell in 1929, he joined the Time-O-Stat Controls Company of Elkhart, Indiana as assistant sales manager. This company was purchased by the Minneapolis-Honeywell Regulator Company in 1931, and "Pat" took charge of the Refrigeration Control Division of that concern. In 1932 he initiated the activity of Minneapolis-Honeywell in the air conditioning field, and for the next five years was prominently identified in this phase of the control business. He then introduced the Polatron System of Refrigeration Control.

Mr. Miller is a graduate of Simpson College and the Massachusetts Institute of Technology. He has been a member of the American Society of Heating and Ventilating Engineers since 1926, having served on several of its Technical Advisory Committees.

In joining the Perfex Corporation, "Pat" returns to many of his old friends who were associated with him in the Time-O-Stat Controls Company.



FRIGIDAIRE PORTABLE WINE COOLER

Catering to the increased market for American wines, the La Salle Wines and Champagne Company, Inc., of Farmington, Michigan, recently sought assistance in devising a workable wine cooling installation from the Refrigeration Sales Corporation, Frigidaire dealer in Detroit, Michigan. The accompanying illustration of a completely portable wine cooler, operated by a 5 H. P. Frigidaire condensing unit shown above is the result. Here's how it works. The apparatus is moved up to a vat and wine is pumped over the cooler, in the process of which it is cooled to 22 degrees F. It is then pumped back into a second vat where it is allowed to stand for a short time, the temperature being allowed to rise approximately five degrees. The wine is then filtered. The cooling process permits filtering out undesirable materials in the wine which results in a clearer wine with increased sales appeal.

CHICAGO-WILCOX CATALOG

THE Chicago-Wilcox Manufacturing Company manufactures gaskets and stampings of metals, asbestos, rubber, paper, fibre, cork and other materials. They are equipped to supply gaskets of any shape or size to the heating, plumbing, refrigeration and power industries.

Their latest catalog on replacement gaskets for refrigeration provides a complete illustrated listing of gaskets for all the most popular makes of refrigerating units and provides an easy way of positively identifying the gasket you need. Write the factory at East 77th Street and Anthony Avenue, Chicago, Illinois, or ask the representative in your territory for one of these catalogs.

Representatives of the company cover the following territories:

Mr. W. A. Griffin, New York City.

Mr. H. M. (Red) Laird, Philadelphia.

Mr. E. V. Dunbar, Atlanta, Ga. covers the southeastern territory—south of the Mason-Dixon line and east of the Mississippi.

Mr. A. A. Ways, Dallas, Texas, covers Texas, Oklahoma, Arkansas and Louisiana.

Mr. Don S. Hupp, Los Angeles, California, covers Washington, Oregon and California.

C. E. HARRIS OPENS OWN BUSINESS

CHARLES E. HARRIS, formerly associated with Legasse & Harris, Boston Kelvinator commercial distributor, announces the opening of his own service organization. Mr. Harris has been in the refrigeration business for over fifteen years and has the best wishes of his many friends on his new venture. The Harris Refrigeration Co. will be located at 292 Main St., Cambridge, Mass.

COMPLETE REFRIGERATION EXPANDS

MR. GEORGE MONJIAN, who formerly operated the Chicago Refrigeration Co., announced recently that he is now associated with the Complete Refrigeration Service at 3819 North Ashland Avenue, Chicago.

In making the announcement he states they are now in a better position to take care of all classes of work including air conditioning, installations, service or shop work.

BOOK REVIEW

THE NEXT GREAT INDUSTRY. By L. K. Wright. Published by Funk & Wagnalls Co., New York. 194 pages. Cloth binding. Price $1.50. For Sale by The Refrigeration Service Engineer, 433 N. Waller Ave., Chicago, Ill.

Here is a timely, non-technical book which covers the field of air conditioning and refrigeration. Written by a well-known author and educator, it presents an important study of the opportunities to be found in this relatively new and decidedly promising industrial sphere. It is packed with all sorts of special information for those who are engaged in this work, or who would like to enter the field.

Mr. Wright tells the history of air conditioning and refrigeration from the earliest methods to present-day machines; what the jobs in the industry are; the knowledge necessary to obtain one; what studies are needed for the work, with a full outline of an approved course. He describes a typical refrigeration machine, the relation and duties of the component parts and how they function.

Classified Ads

Rate: Two Dollars for fifty words or less. 30 cents for each additional ten words or less.

FOR SALE—Tag Dual Pen Pressure Recorders—head pressure zero to 150 pounds—suction pressure 30 inches to 30 pounds—Telechron self-starting clock—110 volts, 60 cycles. Original selling price $77.00, used by prominent refrigerator manufacturer, have been thoroughly reconditioned. A bargain at $20.00 each. Warren W. Farr, 1412 Marlowe Ave., Lakewood, Ohio.

WANTED TO BUY—We are interested in purchasing a Belding-Hall unit for use as a vacuum pump. We want only the compressor and motor. Must be in good condition and motor must be for 110 volts, 60 cycle, a-c. C. E. Mckay, 321 N. Section St., Hannibal, Mo.

BOOKS FOR SALE—Write to Nickerson & Collins Co. for a complete list of books on Air Conditioning, Refrigeration, Ice Making, Cold Storage, Food Handling, Heating, Diesel, Oil, and Steam Engines, Domestic and Small Commercial Machines, and others. These are the best books published today on Refrigeration and related subjects. Nickerson & Collins Co., 435 N. Waller Ave., Chicago, Ill.

AIR CONDITIONING SIMPLIFIED—With the Air Condition Calculator. Everyone in the industry should have one. Eliminates the psychrometric chart. See April '38 R. S. E. page 30. Postpaid $1.50, write Nickerson & Collins Co., 435 N. Waller Ave., Chicago, Ill.

Index to Advertisements